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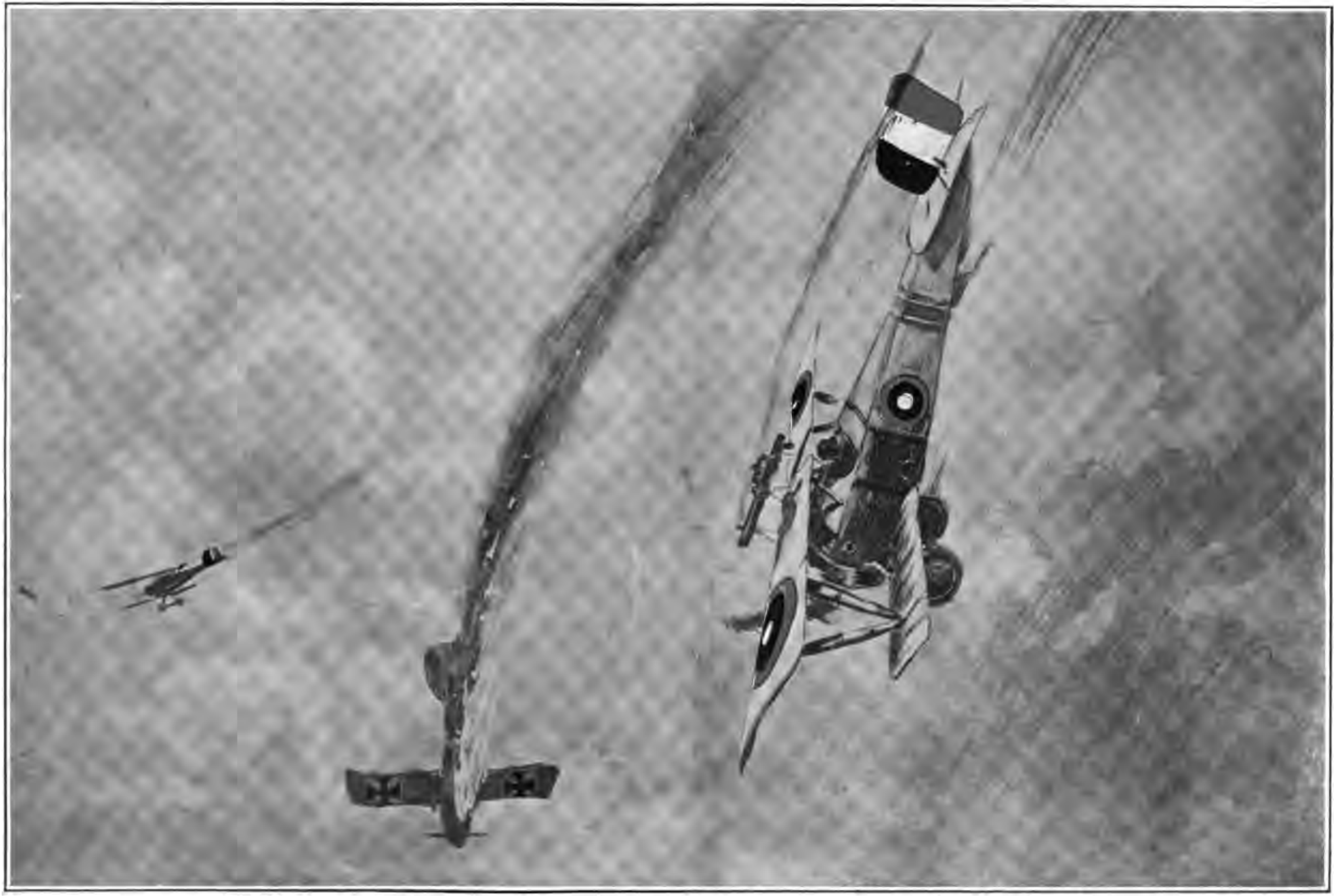
AIR SERVICE MEDICAL MANUAL

WAR DEPARTMENT — AIR SERVICE
DIVISION OF MILITARY AERONAUTICS
WASHINGTON, D. C.



WHERE PHYSICAL FITNESS, MENTAL ALERTNESS, AND MORAL COURAGE ARE ABSOLUTELY ESSENTIAL.

AIR SERVICE
MEDICAL MANUAL

WAR DEPARTMENT : : AIR SERVICE
DIVISION OF MILITARY AERONAUTICS
WASHINGTON, D. C.

▽

WASHINGTON
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1918

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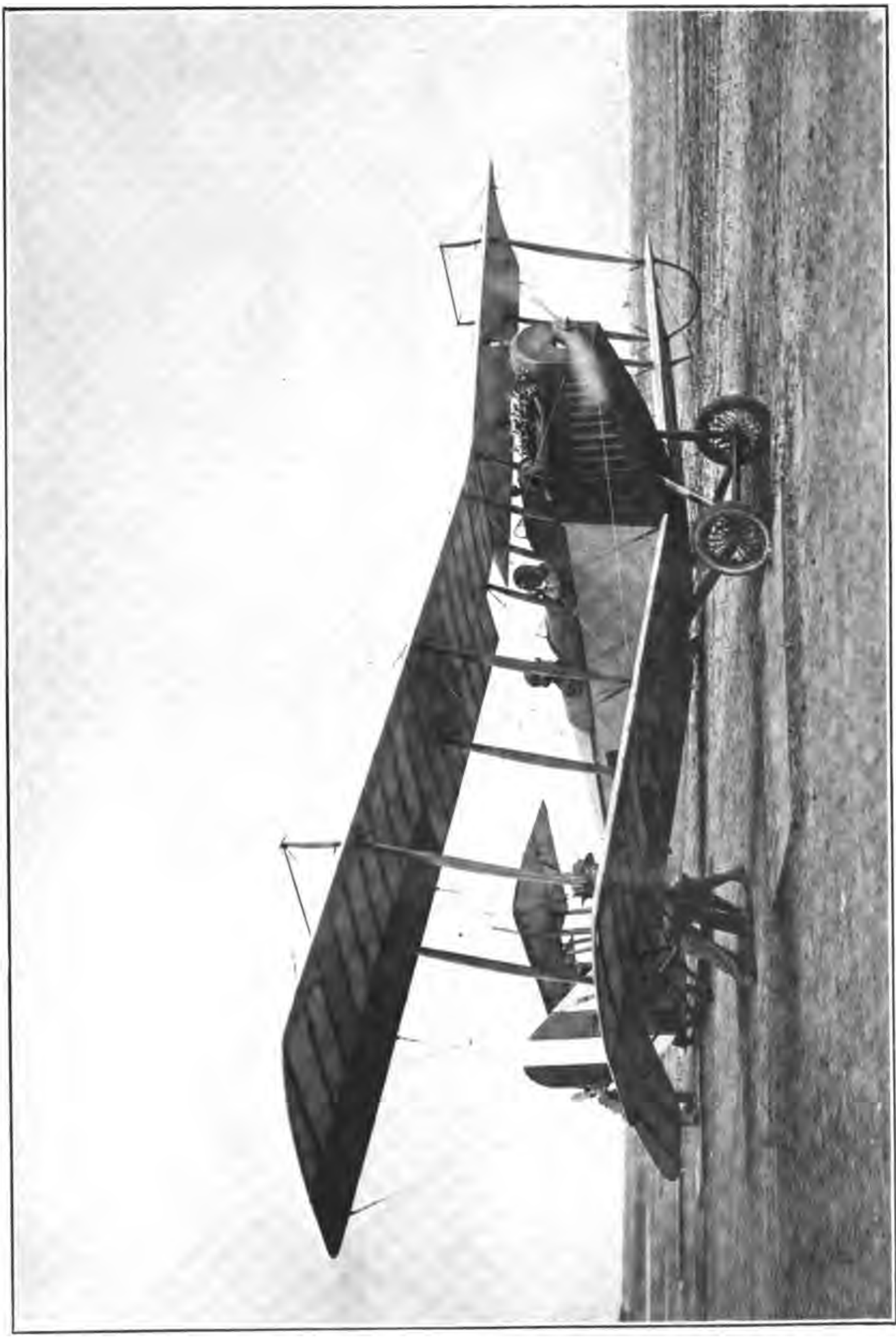
PREFACE.

In each of the countries at war there is a fully established Air Medical Service. Early in the development of the Aviation Service of our Allies, and even earlier in the German Air Service, it was found essential to create a medical department as an integral part of the Air Force. The French and the Italians for the past year have had well-organized Air Medical Services, which include in their personnel many of the foremost specialists of these respective countries. The British, whose Royal Air Force exists as a separate arm of the service, have a separate Air Medical Service with a Surgeon General of Aeronautics. In our own Service, this work has been effectively handled by a division of the Surgeon General's Office, assigned as a part of the Division of Military Aeronautics.

Aviation is new, and the Air Medical Service even newer; so that for educational purposes the director of Military Aeronautics deemed it advisable to issue this book. Its object is to set forth Aviation's debt to Medicine and to make clear the part played by the Air Medical Service in the "winning of the war in the air."

The book is presented in two parts. Part I is a shorter statement of the essential facts which are of immediate general interest. Part II goes into greater detail and is for the information of those who belong to the Air Medical Service or of those who desire to make a more thorough study of this new work.



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PART I.

CHAPTER I.

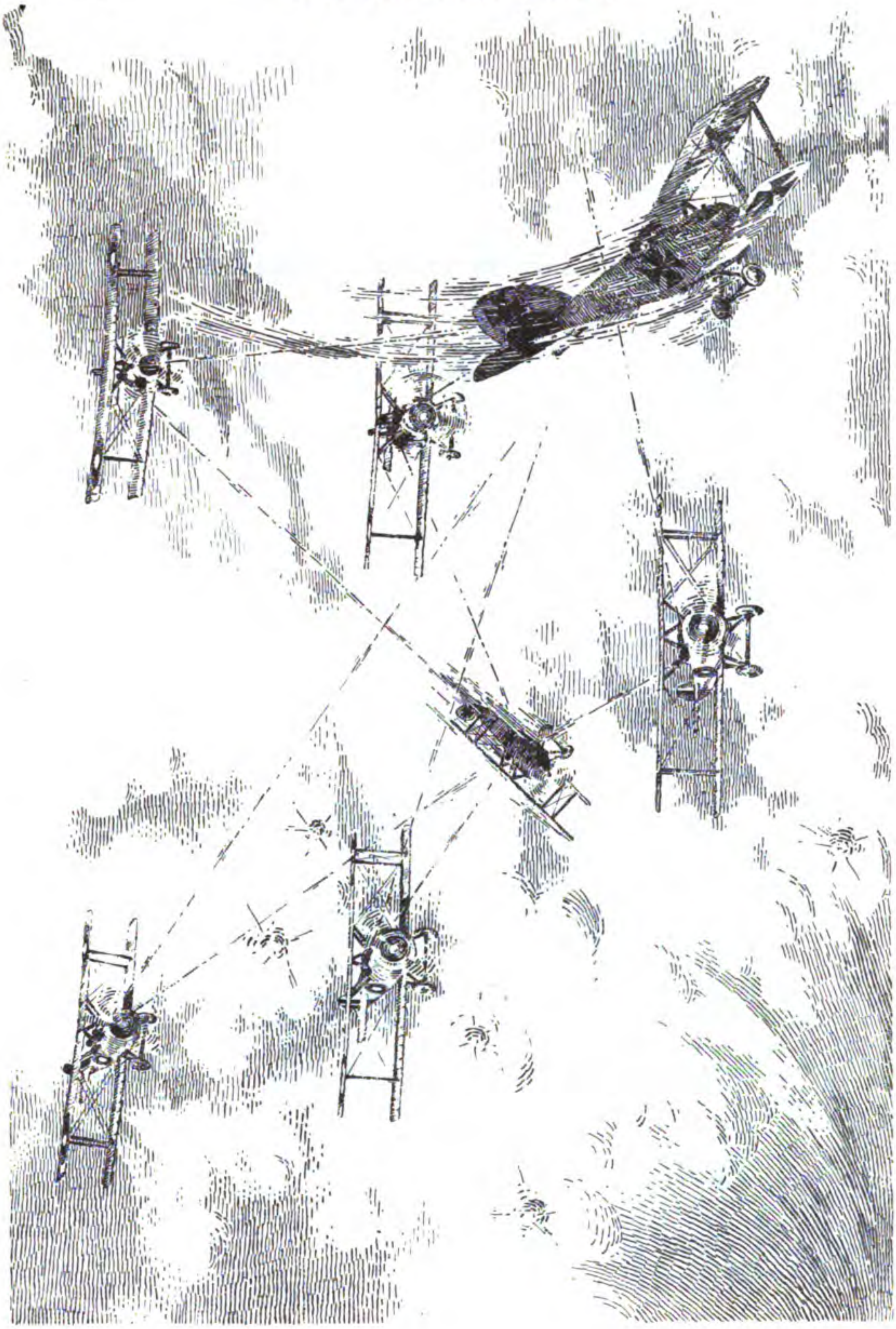
AVIATION AND ITS MEDICAL PROBLEMS.

Wonderful has been the development of the airplane—inconceivable has been the neglect of the MAN in the airplane.

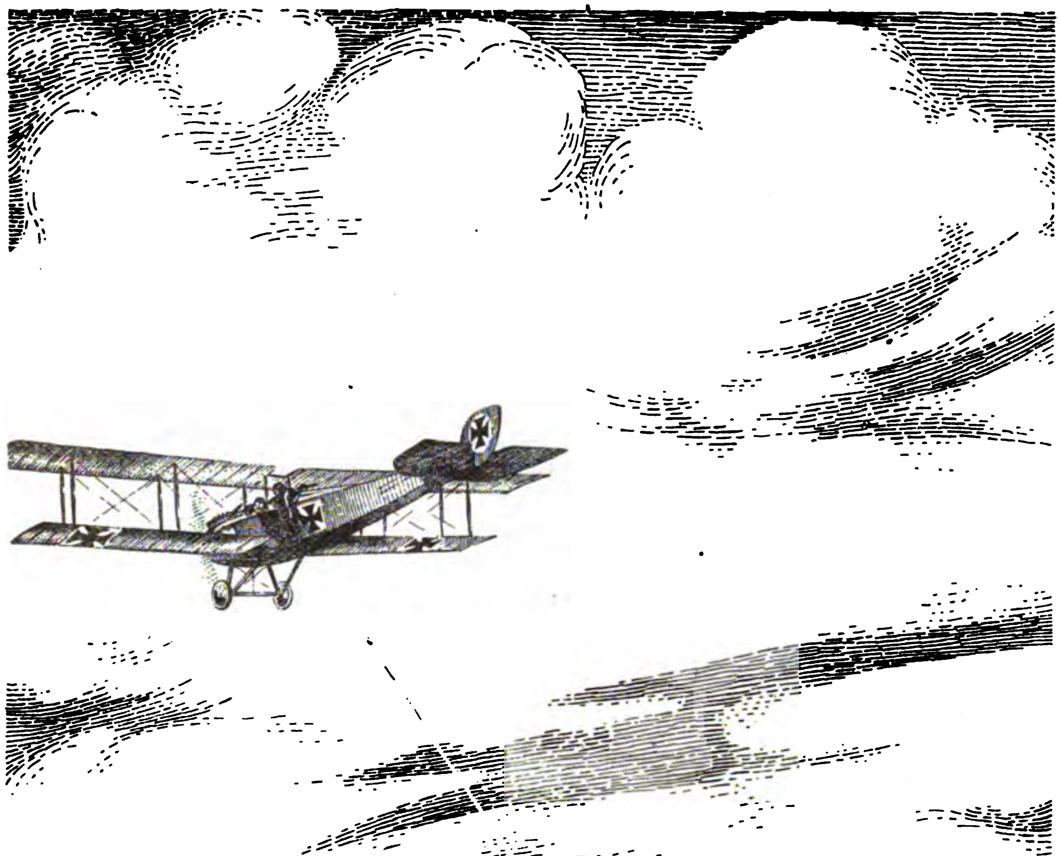
Aviation began in the United States of America. The genius of Langley, Chanute, and the Wright brothers made it possible to maintain in the air a machine heavier than air. Starting as a scientific experiment, aviation has developed with such gigantic strides that to-day, in the defense of our Nation, the Air Force has a place comparable in fighting importance with the land and sea forces.

Ever since the time that man lived in a cave and was obliged to chase his food or be chased by it, he has dreamed of flying. He has racked his brain and bruised his body in futile attempts to emulate the bird. At various stages in his history we see him climbing to the top of precipices, trees, bridges and houses, and from these heights projecting himself into space, with nothing to break his fall except a modified kite, parachute, or some similar contrivance, and landing below with many regrets and broken bones. Gravitation was not to be defied by such rudimentary methods.

Through all time man has been speeding up. The savage, finding himself upon a snow-capped height and desiring to go to the valley below, was wont to set himself upon a piece of bark and slide down to his destination; or, desiring to go down the valley, he stepped into a hollow log and shot the rapids of some swiftly flowing stream. Desiring to cross the plain, he subjugated the horse, and used him as a more rapid means of transportation. Later on civilized man, astride a pair of wheels, propelled himself along the highway by means of a mechanical device. Then the steam engine was invented, and with it the steamboat and locomotive, which enabled man to travel with increased speed. The electric trolley car appeared soon after the perfection of the electric motor. Eventually came the gas engine, and with that the automobile, capable of even greater velocity. It is not surprising that in the United States, the least mature of the progressive nations of the world, this speed mania broke all bounds



STRAFED.

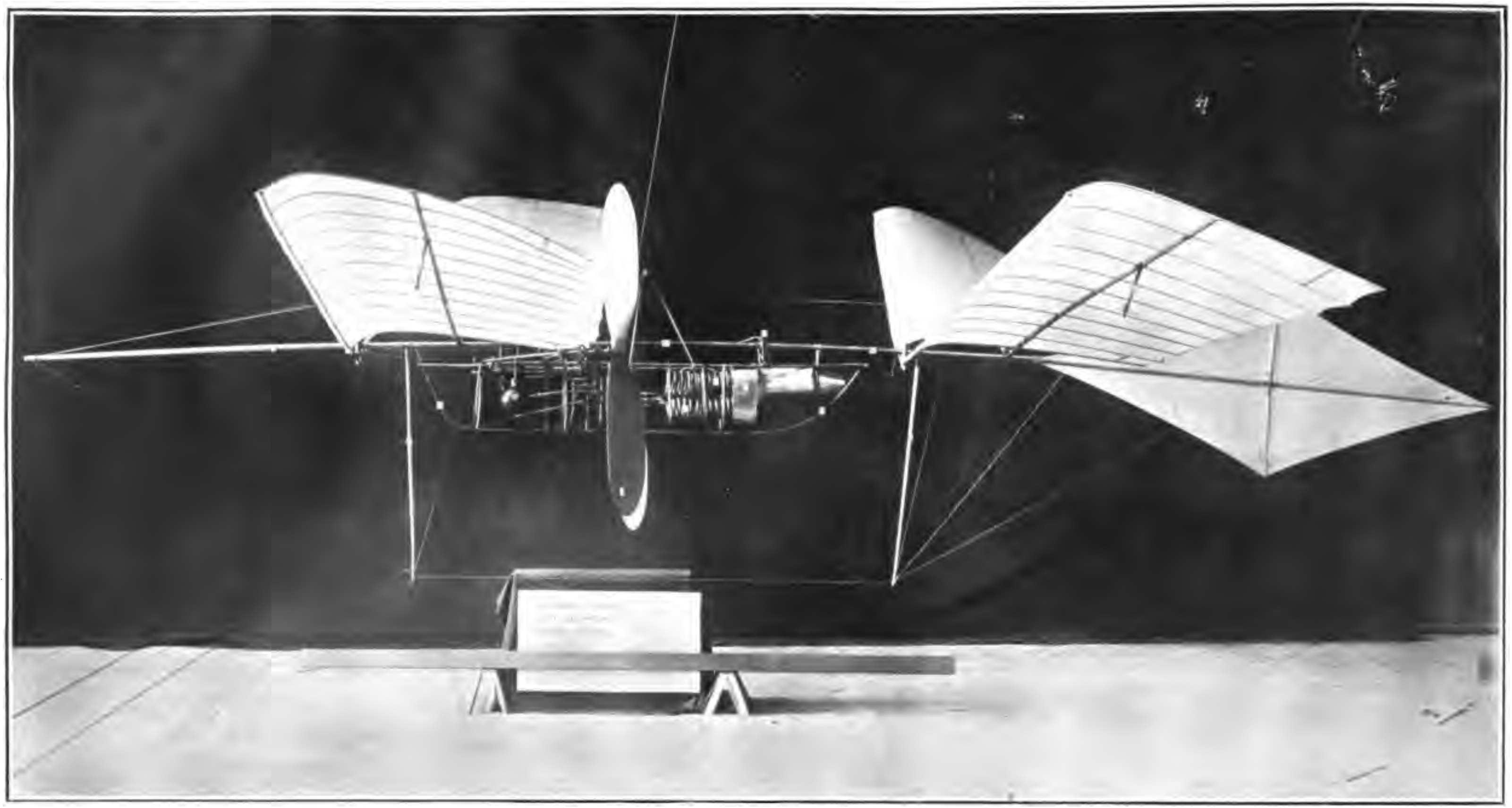


A SITTER.

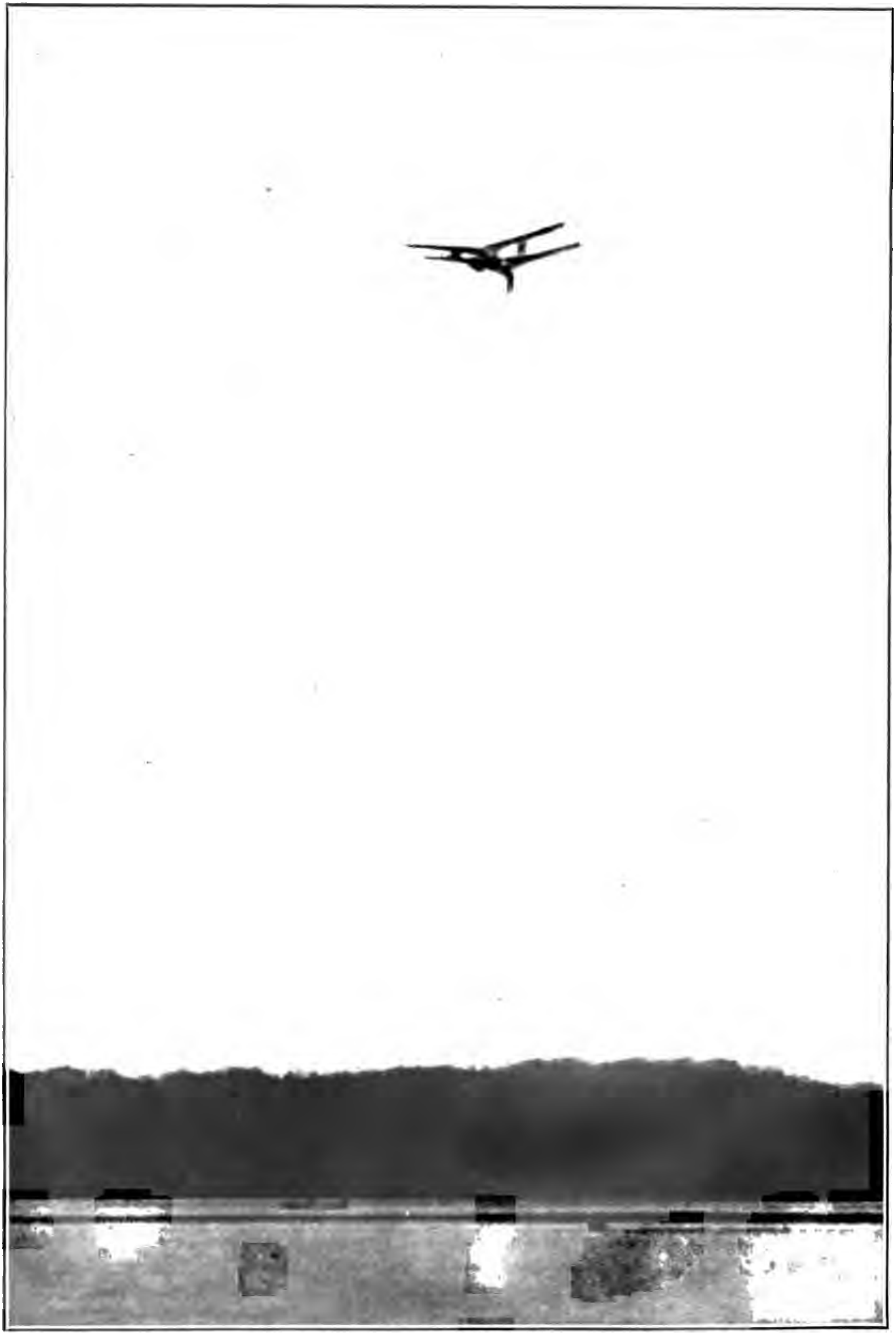
and man flew off at a tangent into space. The Wright airplane had set a new pace.

Each new mode of travel has evolved its own new and peculiar human ills and medical problems. Reverting to the savage, we can picture a new variety of accidents coincident with rudimentary tobogganing. With water transportation came seasickness and drowning, with the various methods of resuscitation. Railroading developed a new category of ills, from caisson disease to "railroad spine;" railroad signaling emphasized the importance of normal color perception. With the development of the electric railway there opened up a new chapter of ills in the form of electric shocks and burns. With the gas engine came Colle's fractures from cranking and an increasing number of collision accidents with the ever-increasing speed. Now with the airplane come the new problems of air-sickness, oxygen-want, and the unprecedented demands on the special senses, the nervous system, and the heart.

While American genius made possible the birth of the airplane, its extraordinary development in such a short space of time is directly due to the drive of necessity arising from actual warfare in Europe. Prof. Langley's theories of heavier-than-air machines were correct; the producers of airplanes have converted them into realities. After the appearance of the Wright biplane, however, flying in this country made little progress; we Americans were slow to appreciate the possibilities of this new invention. The Wright brothers took their machine to Europe, where an immediate keen interest developed in its sporting possibilities, which appealed particularly to the French, Italians and English. The German, ever watchful of anything calculated to enhance the value of his war equipment, immediately took notice and began airplane experiments. Thus the French, Italian and English interest had its root in the appeal of the plane to sporting instinct; the German interest, on the other hand, sprang from "Kultur," in recognition of its possibilities as an additional weapon of war. The development of the airplane among the Allies is a story of sportsmanship; among the Germans it is part of the secret annals of war preparation. During the early stages of the war air superiority lay with the Germans and was represented mainly by their development of the Zeppelin. During this period the Germans placed their trust in the lighter-than-air type of machine; at the same time they did not neglect the heavier-than-air type. It was not until 1916 that, under the spur of war conditions, both belligerents came to a full realization of the immense possibilities of the airplane as a factor in battle. It is, therefore, the other nations who have developed the airplane, and we now look to these nations for advice and instruction in aeronautics; it is a case of the pioneer taking the position of a novice in his own field of endeavor.

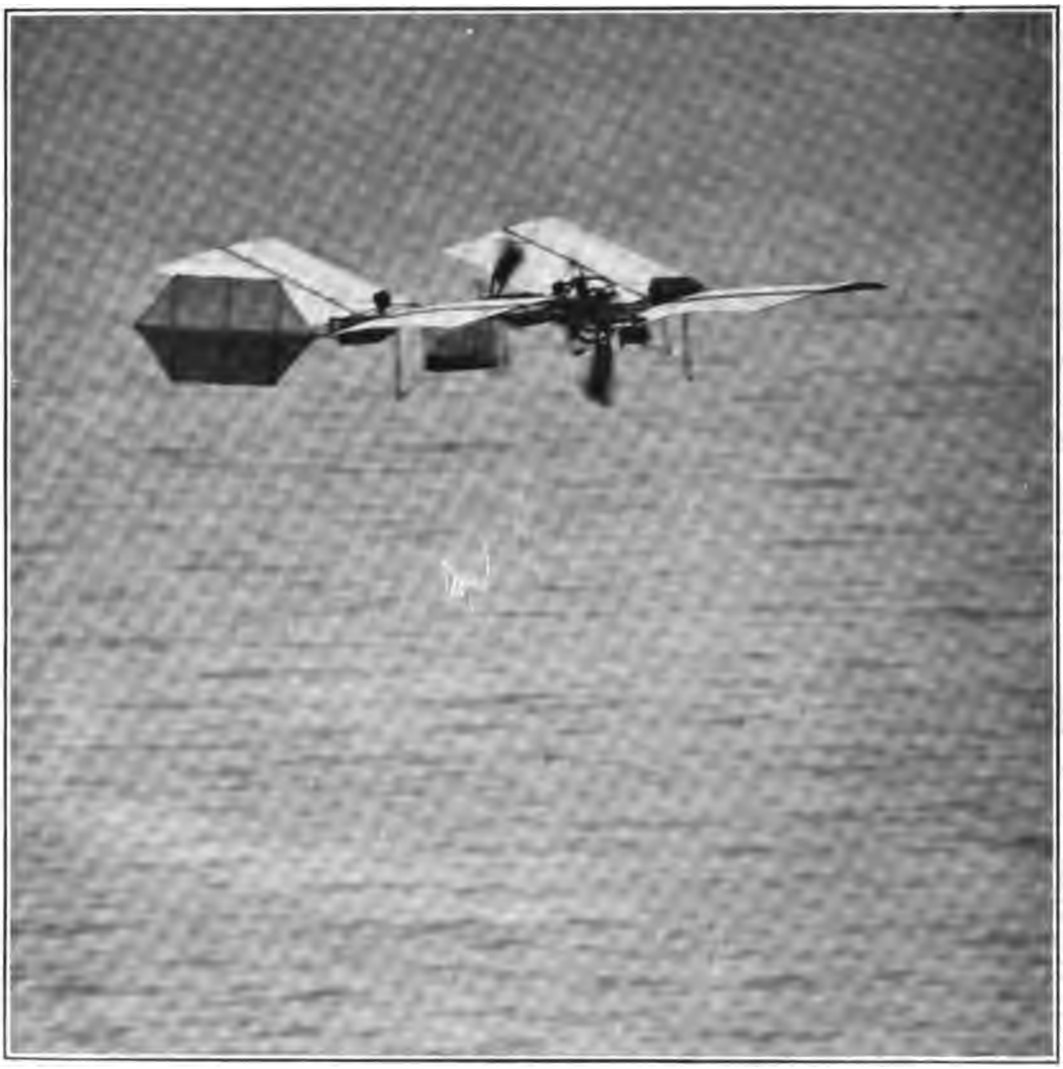


LANGLEY STEAM-DRIVEN AERODROME WHICH MADE NEAR QUANTICO, VA., MAY 6, 1896, THE FIRST SUSTAINED FLIGHTS UNDER ITS OWN POWER EVER MADE BY A HEAVIER-THAN-AIR FLYING MACHINE.



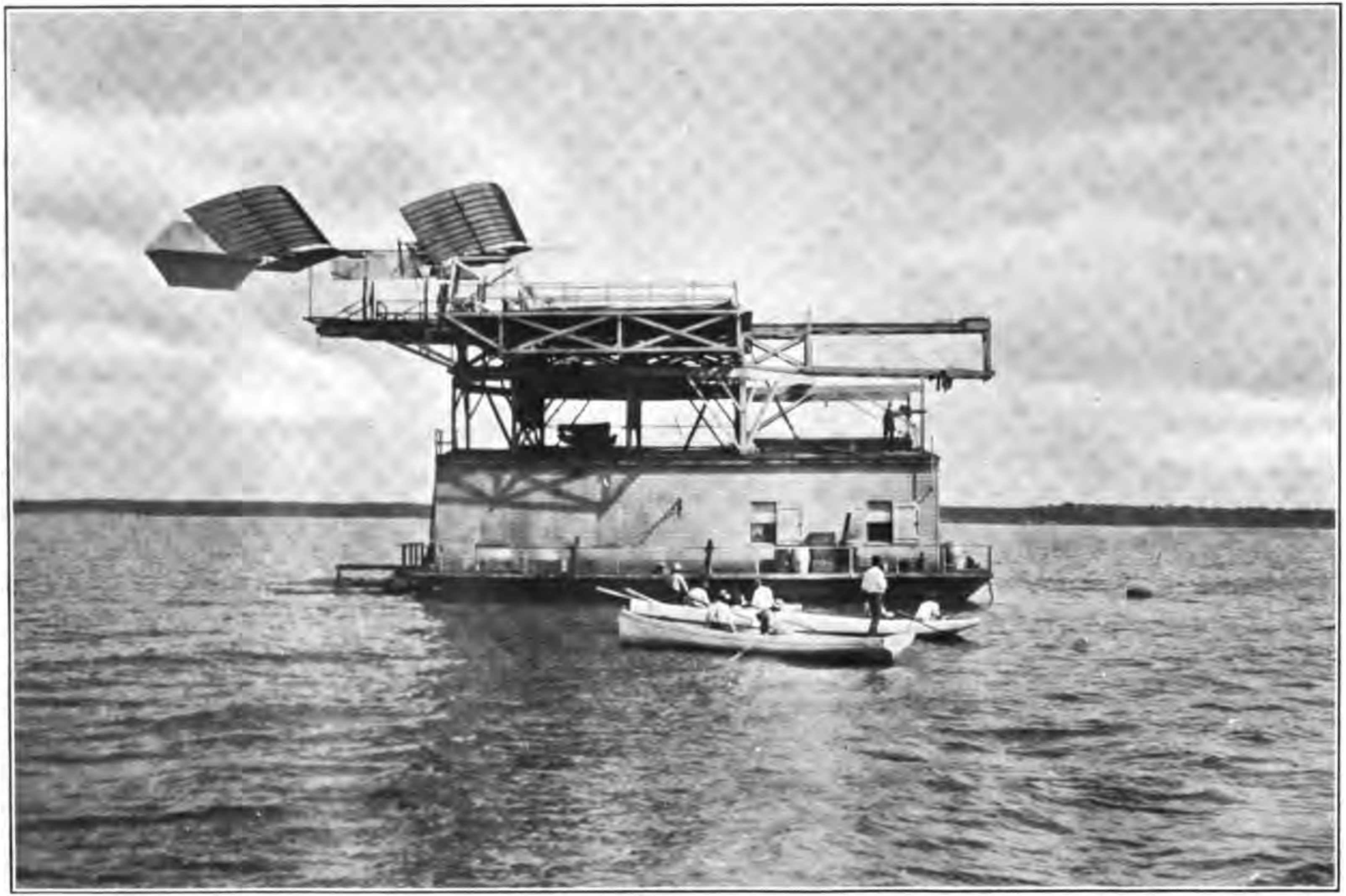
LANGLEY STEAM-DRIVEN AERODROME IN FLIGHT OVER POTOMAC RIVER NEAR QUANTICO, VA., MAY 6, 1896.

10a-2

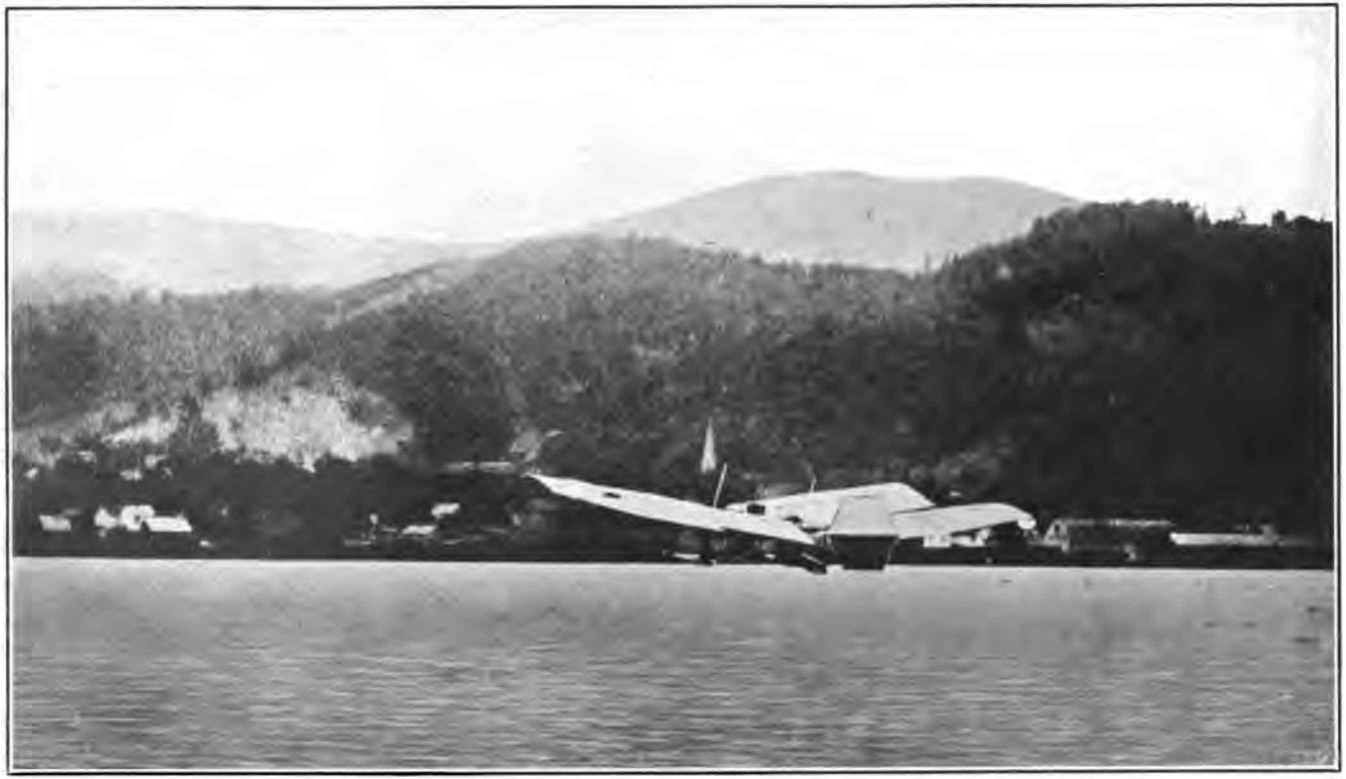


QUARTER-SIZE GASOLINE MODEL, LANGLEY AERODROME, IN ONE OF ITS FLIGHTS OF AUGUST 8, 1903, ON THE POTOMAC RIVER.

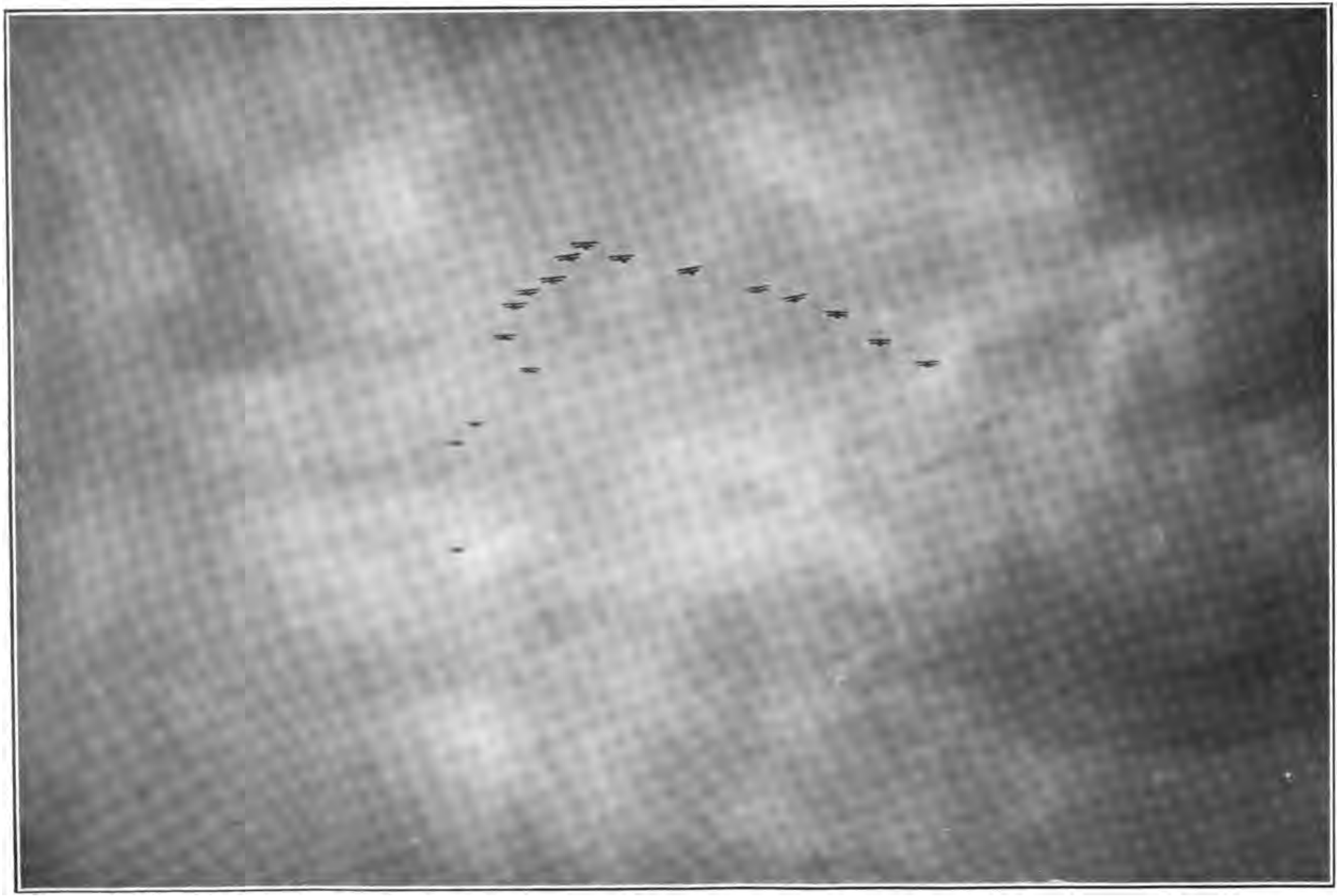
10a–3



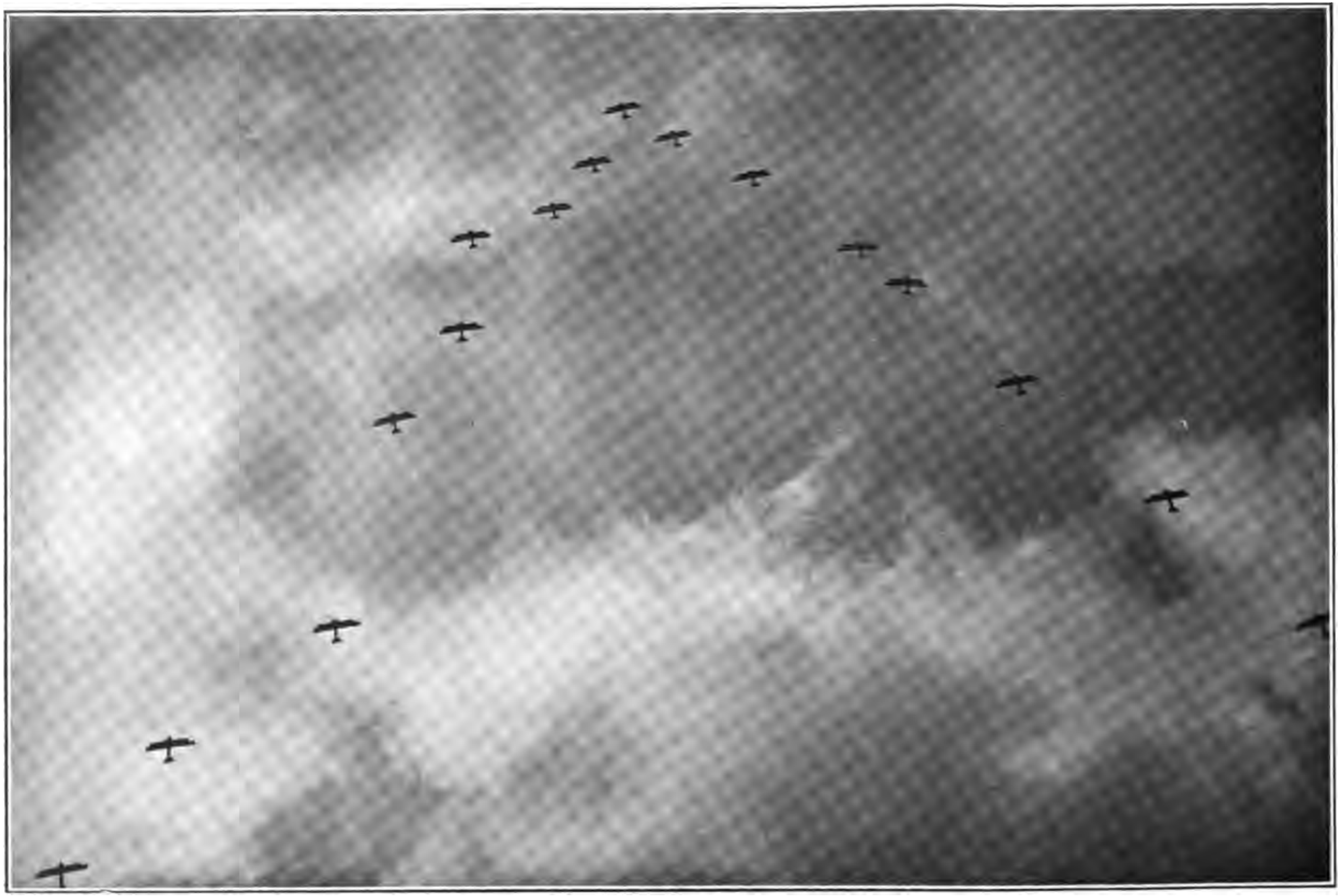
FULL-SIZE MAN-CARRYING FLYING MACHINE READY FOR LAUNCHING, 1903.



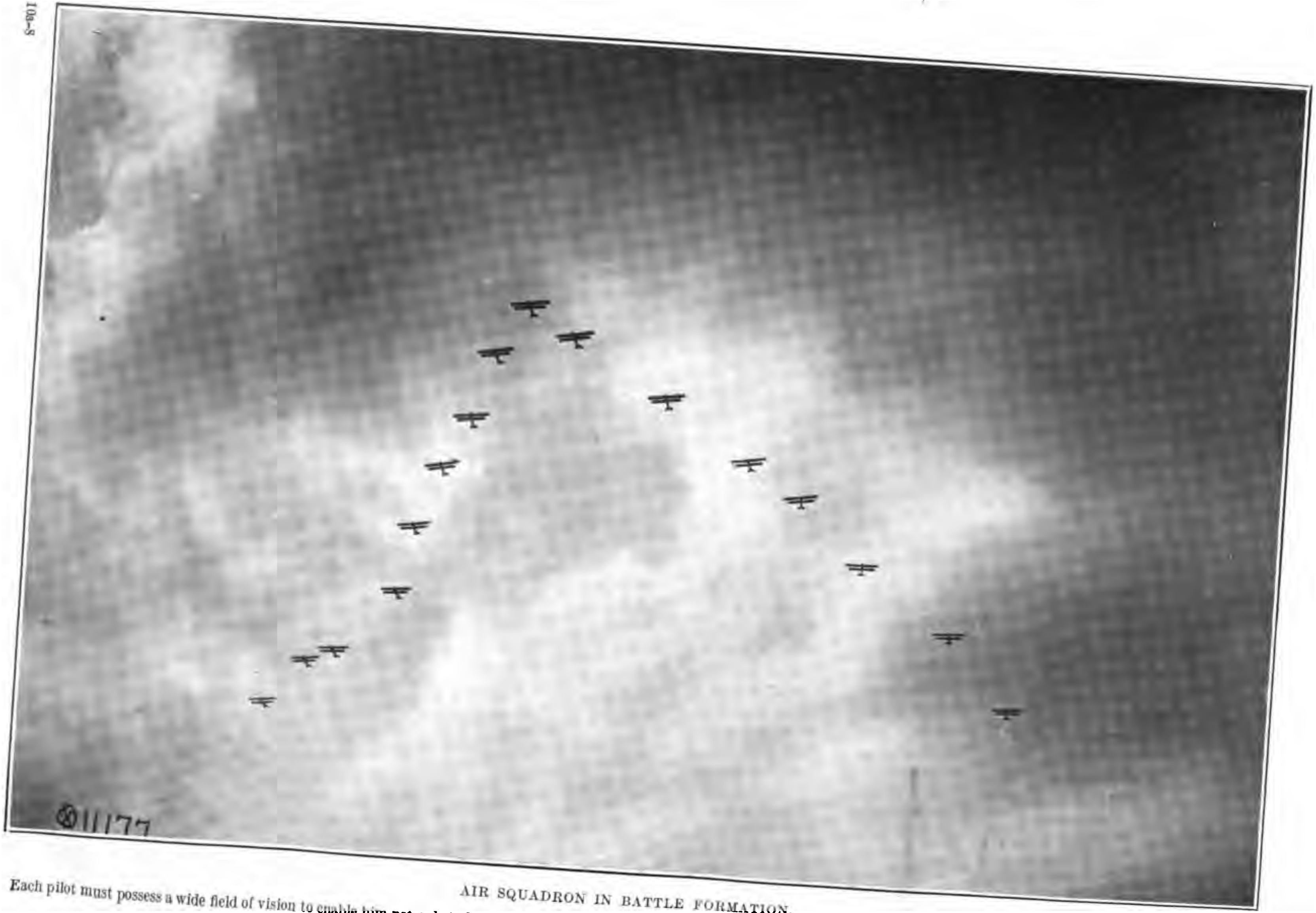
FULL-SIZE MAN-CARRYING LANGLEY FLYING MACHINE IN FLIGHT JUNE 2, 1914, OVER LAKE KEUKA, N. Y. FLOWN BY GLENN H. CURTISS.



AIR SQUADRON IN BATTLE FORMATION.



AIR SQUADRON IN BATTLE FORMATION.



AIR SQUADRON IN BATTLE FORMATION.

Each pilot must possess a wide field of vision to enable him not only to keep his position with his command but to detect enemy planes which have a habit of slipping up on a pilot for an attack.

CADET APPROACHING PLANE WITH INSTRUCTOR ON HIS FIRST TRIP. THE CADET IS MERELY A PASSENGER.

A CADET AND HIS INSTRUCTOR.

INSTRUCTOR IMPRESSING UPON THE CADET THE USE OF THE RUDDER.

CADET AND INSTRUCTOR IN THE MACHINE.

The instructor is assisting the cadet who is experiencing an air trip for the first time.

CADET RECEIVING FINAL INSTRUCTIONS BEFORE GOING ON A FLIGHT ALONE.

This cadet has completed his preliminary course and is about to start on a solo flight.

STARTING OFF ON A FLIGHT.

10a-11

PILOT AND CADET SLOWLY AND CAREFULLY DESCENDING TO A LANDING PLACE.

CADET DESCENDING FOR HIS FIRST LANDING.

CADET EXPERIENCES FIRST HALF HOUR IN AN AIRPLANE.

The instructor made a perfect landing without bumping, much to the satisfaction of the student.

10a–13

A CADET READY FOR HIS FIRST SOLO FLIGHT.

A CADET AFTER HIS FIRST SOLO FLIGHT.

Having had his first ride he smiles all over upon landing.

It is easy to see how the necessity for attention to the physical efficiency of the pilot came to be overlooked; the world over, everyone has been so absorbed in the one effort—to increase the mechanical efficiency of the airplane. Every thought has been directed toward making each successive model safer and faster.

During this period, representing the first two and one-half years of the war, the pilot was not selected because of any peculiar fitness for flying; it was simply a question of whether he "had the nerve." At one time circumstances made it necessary to place men in the Aviation Service who were "all worn out by the more trying work" of the Infantry or Field Artillery. The viewpoint was: "This man is no longer fit for ground fighting; therefore he will do for the air service." The result of this policy was that the average aviator had a very short time of usefulness and there was, to this extent, some truth in the persistent rumor that the "active life of the aviator at the front was only a certain number of hours." There was enormous avoidable wastage. Little by little the Aviation Services of our Allies have come to realize that the advice of their medical officers was sound; the mental and physical requirements for entering the Air Service were raised, with an immediate saving of an unlimited amount of money and personnel. This is the great lesson we have learned from the bitter experience of our Allies.

The popular idea that a flier must be a "superman" is utterly absurd. It would be much nearer the truth to say: "Anyone can fly." Flying itself is now just as prosaic and commonplace as riding in a motor car, and not more dangerous. To consider that the aviator at the front is in greater danger than his brother in the trenches is ridiculous; actual statistics prove that it is far safer in the air. Further than this, instead of living in the filth of the trenches, the fighting pilot returns to a comfortable airdrome well behind the lines, where he sleeps in comfort and one might even say in comparative luxury.

Nevertheless, aviation is not merely spectacular; it does have its unique problems and makes its unique demands upon those in this service. Nature never intended that man should fly. From the time that he leaves the ground until his return, he is living under unnatural conditions. Although it should be emphasized again and again that the flier at the front is safer than the infantryman in the trenches this does not mean that we should belittle the conditions which the aviator faces. He flies in an atmosphere lacking in that oxygen which is the "breath of life"; subjected to the shells of anti-aircraft guns, or encountering enemy aircraft at any moment; with his body at a dizzy height and hurtling through space at the rate of 125 miles an hour—this represents the daily life of the fighting pilot. The aviator himself is serenely unconscious of the effect of these conditions upon his nervous system; he naturally regards it as "all in a day's work." Yet in attaining altitudes and spending much of his time in rarefied air, the flier is defying nature.

The conquest of the air represents man's maximum achievement. There is no combination of wood and wire which is subjected to such a variety and intensity of strain and stress as the airplane; there is no living combination of muscle and nerve which, consciously or unconsciously, may be subjected to such a variety and intensity of strain and stress as the aviator.

To-day thousands of trained mechanics are working day and night upon the engines of our airplanes; thousands of expensively trained riggers and sailmakers are tuning the wires and mending torn fabric; thousands of hangars are provided to house the planes when they are not flying. A striking discrepancy is noted when we look about to see what is being done to take care of that infinitely more delicate organism—the man who flies the machine.

The pilot of the airplane is the heart and brain of the whole flying apparatus. The engine may fail through lack of care, but the pilot brings the machine safely back to the airdrome. A carelessly inspected wire may snap in the air, but nothing serious results. When the pilot breaks, even momentarily, nothing is left to direct the flight, and the plane and engine, no matter how well they have been cared for, crash and are lost.

The mechanic who looks after the troubles of the engine must be an expert. Work like this is not for the mediocre. No less an expert must be that man who supervises the condition of the pilot. Flying, especially in the military service, coupled with the temperament peculiar to the man choosing this kind of work, develops a most extraordinary series of problems and complications. Many an aviator in a short time becomes a subject over which a genius in medicine might easily become discouraged.

The establishment by our forefathers of the West Point Military Academy was a wise forethought. In this institution a curriculum of four years' intensive study prepares our young men for the profession of the soldier. In this war, however, an important and novel military situation has arisen; even West Point does not offer a solution of this problem. The Air Fighting Force is without military precedent to furnish instruction in all its details. The problems of this war on the ground, while new in many aspects, still could be met by the skill of the engineer and the tactician with fundamentals furnished by years of military experience and study. The problems of the present war in the air lack the accumulated experience of previous wars to indicate their solution; those difficulties, which early made it apparent to our Allies that an air-fighting force has its own potentialities of disaster, presented the immediate problems of our Air Service.

To the Air Medical Service the problems were presented of overcoming all those conditions affecting the physical fitness of the man who, leaving his natural environment, the ground, straps wings to his body and soars to heights into which even the eagle dare not go. For work in this unnatural environment only the man who is in every way physically fit should be selected.

When our Air Medical Service was established it was fortunate to have at hand a series of reports of the Air Medical Services of our Allies by medical officers who have attained distinction in the field of scientific research. Birley, Dreyer, Haldane, Flack, Douglas, and Priestly among the British; Nepper, Josue, Lombaert, Guilbert, Garsaux among the French; Gradenigo and Herlitzka among the Italians, had been studying for years the physical deterioriations peculiar to flying which, even early in the war, so emphasized the military importance of this particular problem of the Air Service.

The keynote of the American Air Medical Service is the handling of the flier as an INDIVIDUAL.

During the early part of the war the German method of air fighting was patterned after that of their infantry; the pilot of the machine received his commands and carried them out regardless of changing conditions.. The observer in a two-seater machine gave the pilot his orders, just as an infantry officer gave orders to his subordinate. There were only a few picked flying officers, usually of high social position, who were what might be called "sportsmen." The efficiency of the German Air Service was greatly increased in the year 1917 by their allowing a certain freedom of action to their pilots in order to cope with the more speedy allied air-men who had proven individually far superior in action, spirit and initiative. Infantry and cavalry which strike in large numbers must be handled as a single force; they must have coordination and absolute oneness of action or half their effectiveness is lost. The efficiency of such troops is measured by the successful handling of a large striking force as a single unit. The aviator is the rank and file and commanding officer, all in one. The outcome of a reconnaissance flight may determine the fate of thousands on the ground; but it is the flier's individual decision, initiative and action, that spell victory or defeat for him.

The Air Medical Service, devoted as it is entirely to the study of the flier as an individual, naturally falls into three main lines of activity—the Selection of the Flier, the Classification of the Flier, and the Maintenance of the physical efficiency of the Flier. These three branches of the Air Medical Service are presented in concise form in Part I of this book. In Part II is given a fuller discussion of these same subdivisions.

Underlying " Selection " is a full realization that it is possible for a man to fly in spite of one or many handicaps; the object to be attained, however—the defeat of the enemy—demands that only such fliers be sent against him as are the very best air-fighting material—not merely men who are able to fly.

" Classification " is the second step. The flying service is now highly specialized. Men are called upon to perform widely diversified classes of work, such as pursuit, reconnaissance, photography, bomb-dropping and night-flying. Not every aviator, regardless of perfect training and physical fitness, is necessarily fitted for all types of air activities. There is a marked difference in the individual ability to withstand a diminished oxygen supply; this has made it necessary to classify the fliers on an altitude basis. By means of tests applied at the Medical Research Laboratory at Mineola, Long Island, and at the branch laboratories in the various flying schools throughout this country and overseas, fliers are being classified as fitted for low, moderate, and high altitudes, night-flying, and other special types of work.

The " Maintenance " of physical efficiency of the fighting force is the supreme function of the Air Medical Service. There is a sharp contrast between the work of selection and the work of maintenance. In selection the sole object is that all questionable material be *kept out* of the service. In maintenance the great object is that every aviator be *kept in* the service.

When an airplane begins to show signs of trouble, it is taken off the field and put in condition. This is the only way to keep a plane in commission. When the flier shows the first signs of staleness, of nervous exhaustion, or of digestive disturbance he must be " overhauled " by a medical expert. That distinctly American product—the Flight Surgeon—bears the same relation to the flier that the mechanical expert bears to the airplane.

The airplane is in need of frequent overhauling; the flier even more. The secret of prolonged usefulness of any aviator is that he be kept constantly fit. The Flight Surgeon, by both old and new diagnostic methods, supplemented by his knowledge of the peculiarities of the individual flier, is able to detect very early, the signs of deterioration. The corrective measures to be applied will belong to one of three classes. They are medical, physical, and what we may term nutritional. The medical needs constitute especially the problem of the Flight Surgeon. In order to supplement his work and take care of the physical needs of the flier, there have been secured for the Aviation Service the services of experienced college trainers. These men have been given a course of instruction covering the special aspects of physical training as it applies to the care of the flier, and have then—as Physical Directors—been sent out to each flying field to assist the

Flight Surgeon. These Physical Directors fill a special need in the work of "maintenance" in that they bring to this service the practical experience already derived from the handling of athletes in colleges or athletic clubs.

In order to handle most successfully the third class, namely, nutritional problems, the services of the Nutrition Officer are required. The Nutrition Officer must be a man well trained in the knowledge of food values in relation to the body and he, under direction of the Flight Surgeon, is charged with not only the problem of the proper feeding of the normal flier, but especially of the flier suffering transitory digestive disturbance—a type of defect that affects greatly the efficiency of the flier when in the air.

The work of the Air Medical Service reached its culmination with the placing of a Flight Surgeon in each flying school in the United States where his work in the "care of the flier" has been but a preparation for the larger service to the aviator who is actually on the fighting front overseas. It is only through the complete Flight Surgeon Service, including those features supplied by the Physical Director and the Nutrition Officer, that the flier may be maintained at his full efficiency in active service.

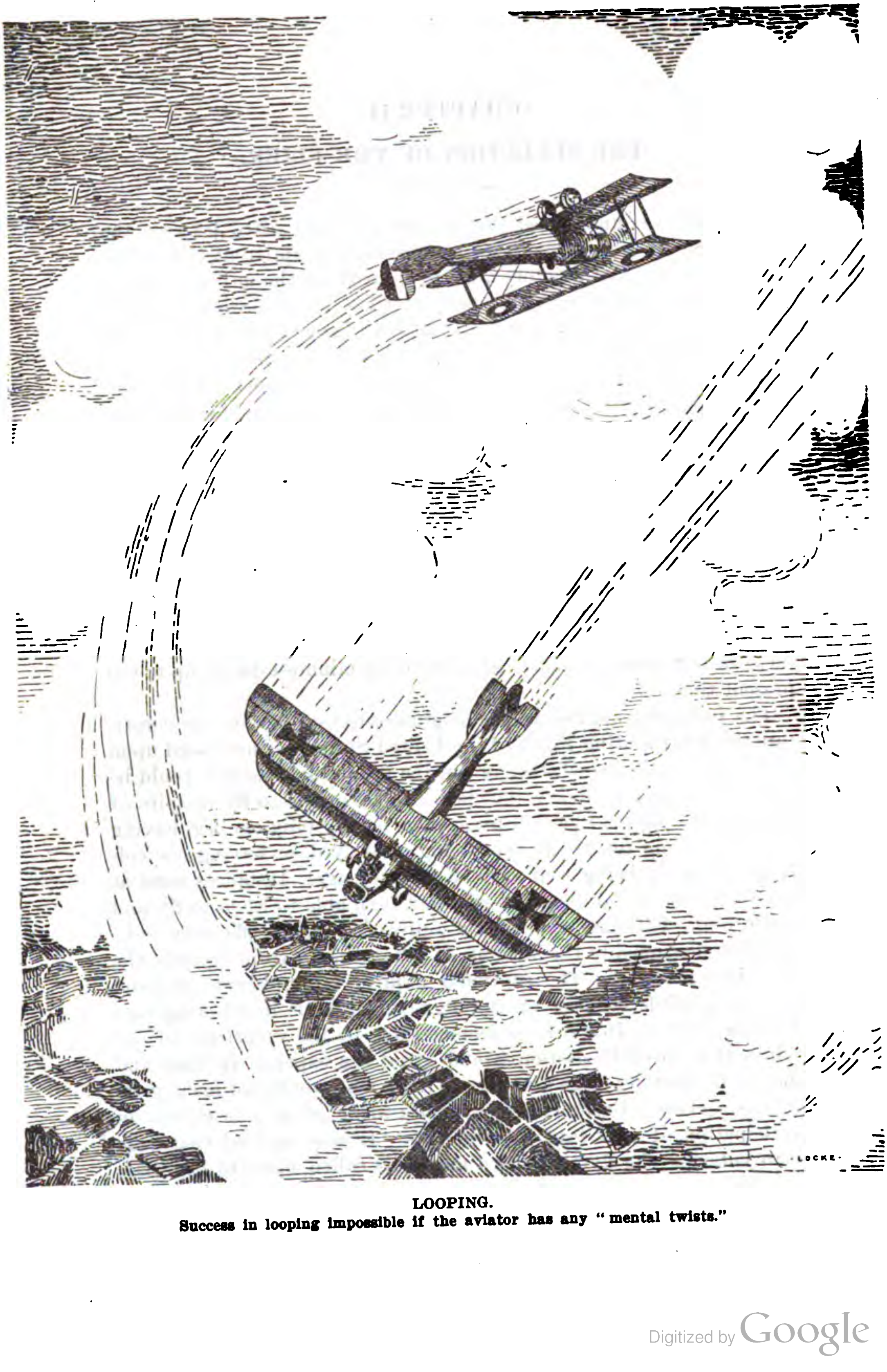
CHAPTER II.

THE SELECTION OF THE FLIER.

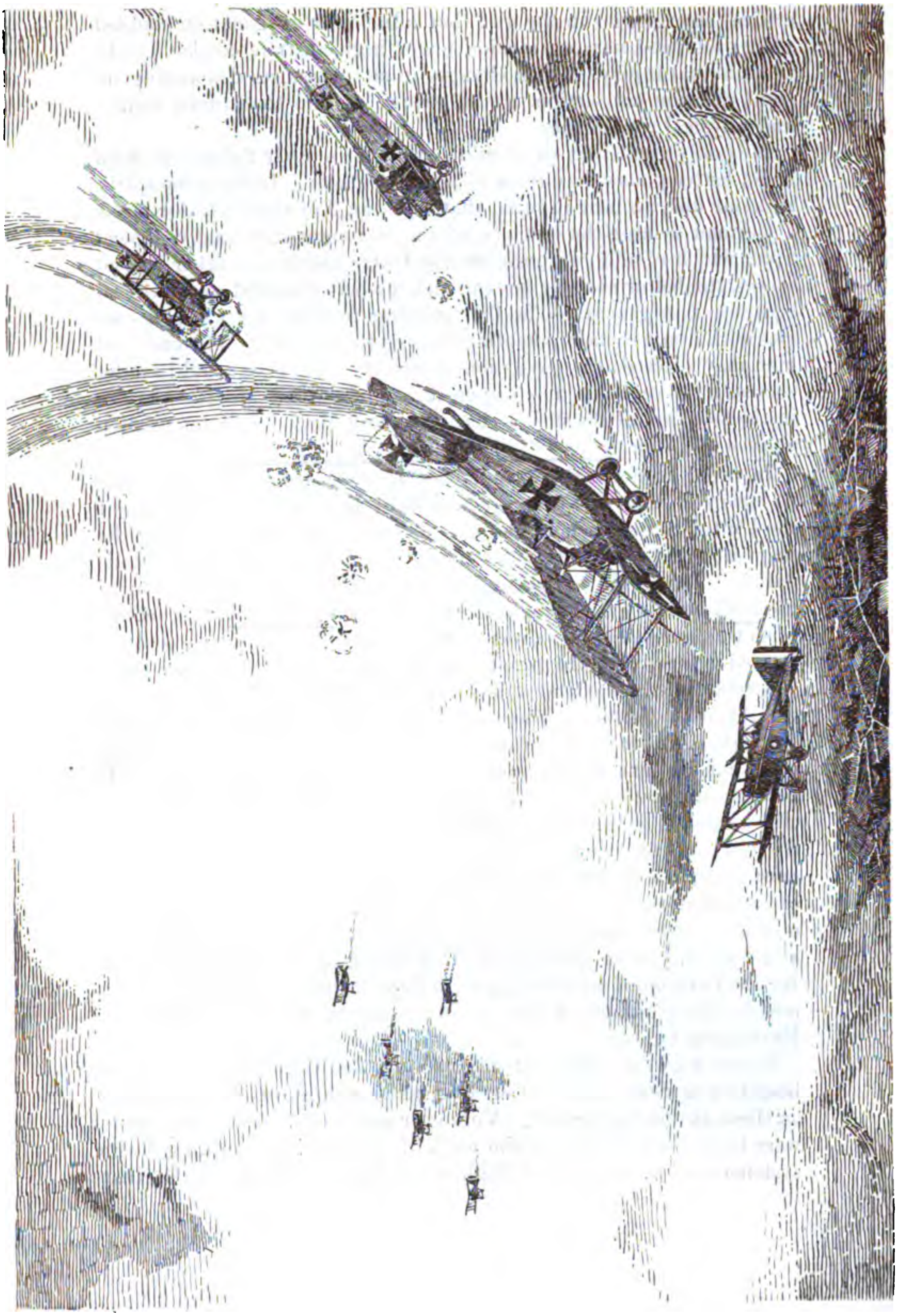
When it was announced that a state of war existed between the United States and Germany, it at once became apparent that a tremendous number of aviators must be secured for the military service within the shortest possible space of time. The medical problem consisted of selecting thousands of physically acceptable men for aviation and placing them in training for war service immediately.

It was found necessary to decide upon new methods of physical examination and to adopt new standards of physical qualifications for this branch of the service. Before our entrance into the war considerable thought had been given to the problem of what should constitute the physical requirements for admission into the aviation service, and medical officers had been in conference with other members of the medical profession who were interested in this question. Due consideration also had been given to the study of the requirements formulated by England, France, and Italy, and also Germany. The examination according to amended blank 609, A. G. O., was put into operation in May, 1917, and it is worthy of note that this same series of tests remains unaltered, even to the minutest detail, up to the present time.

The judgment applied to the original selection of those to constitute the Air Fighting Force of the United States was not based upon an attempt to decide whether or not the individual selected would be able to fly. It was known that men had been able to fly in spite of one or more physical handicaps, such as having only one leg, having one eye, having tuberculosis, or being cross-eyed, or having one collapsed lung, or being well over 50 years of age. Instances were at hand of those so handicapped who had been able to learn to fly and to fly well. Ultimate economy as well as immediate efficiency indicated unquestionably the wisdom of admitting to training only the very best material. The enormous number of applicants at hand made it possible to maintain the highest standards in selecting men for this service. It had been demonstrated by the experience of our Allies that careful selection would avoid the expense, in time and money, of training large numbers of those who would not make good in the service. Furthermore, our measuring stick was chosen in anticipation of peak-load requirements. It was realized that each man entering the flying service might be called upon to negotiate



LOOPING.
Success in looping impossible if the aviator has any "mental twists."



THE JACKALS.

To keep the formation the aviator has to keep both his nerve and his head.

critical emergencies in the air; that insufficient oxygenation coupled with prolonged nervous tension under high altitude combat conditions, actual injury, sudden changes in circumstances demanding instant decision and action, would require of him the utmost mental and physical capabilities.

It is only right that we should supply for our air fighters as good if not better planes than those used by the enemy. In the same spirit, it is our duty to bear in mind that when an American aviator meets a German aviator the outcome of the encounter may easily depend upon which of the two possesses the better vision and other special senses, the better nervous system, and the better mental and physical equipment in general. The flier starting for the enemy's lines carries with him a certain potential disaster for the Hun. The one-eyed man may succeed; the possession of two eyes, however, would render success more certain. The responsibility of the Air Medical Service in the selection of the flier is that no aviator shall fail in his mission against the Hun because of discoverable physical defect.

In order to make the examination of standard character, it was necessary to make the tests practicable of application in all parts of the United States without at the same time in any way lowering the requisite rigid standards or lessening the completeness of the examination. This could be attained only by (1) the standardization of the tests and (2) the standardization of the examiners. To accomplish this, a medical officer was sent to each of 35 cities throughout the United States, with the result that in each one of these cities there was established a medical unit for the examination of applicants for the Aviation Service. The requirements of the examination were fully explained to each unit, so that not only the same equipment was used, but also exactly the same technique. This made it impossible for any applicant to say, "I wish I had been examined in a certain city where the tests are easy, rather than in a certain other city where the tests are exacting." Those specialists were selected who were most expert in the practice of their chosen work; where a new type of examination was essential, such as the turning-chair tests, those otologists were selected who were familiar with these tests, and, in addition, they were given intensive training by medical officers sent for the purpose of establishing a uniform technique. Thus in a few months the examination was put on a uniform basis in all Physical Examining Units.

In order to save time, already existing institutions, such as large hospitals or State universities, with their equipments, were utilized as these examining centers. Volunteer staffs of civilian consultants were locally organized and the work of the Physical Training Units systematized to a point of highest efficiency, with the result that

JUST MISSING A FLAGSTAFF.

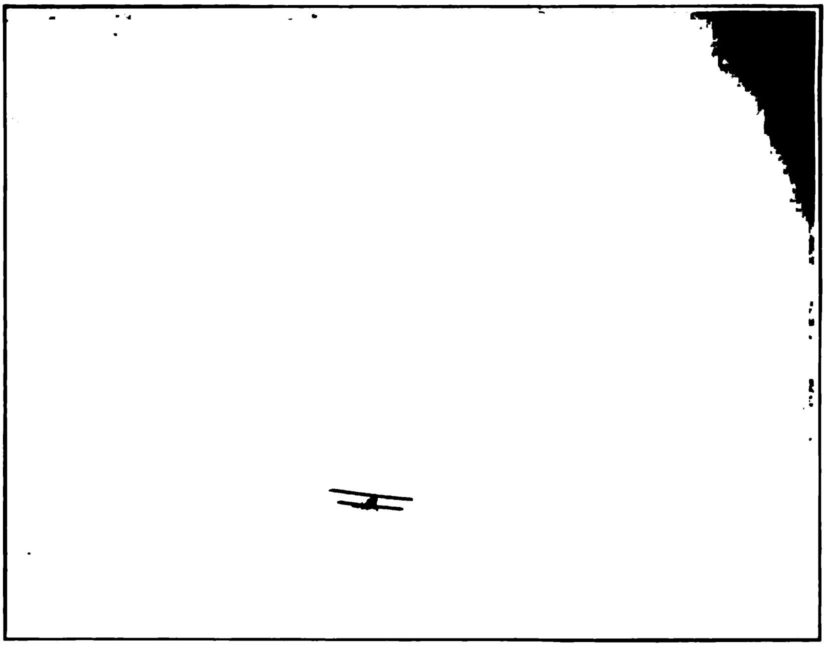
Prompt action, intelligently executed, saved this flyer and his machine from a crash. Fighting in the air makes continual demands on such ability.

MAKING A PERFECT LANDING.

This requires perfect stereoscopic vision.

FIGHTING IN THE AIR MAKES THE MOST SEVERE DEMANDS ON PILOTS.

Only the most fit are chosen for this work.



CADET AMONG THE CLOUDS.

A situation in which vision is of little use. The "motion-sensing" portion of the interval ear must be normal, or the pilot can not detect movement normally.

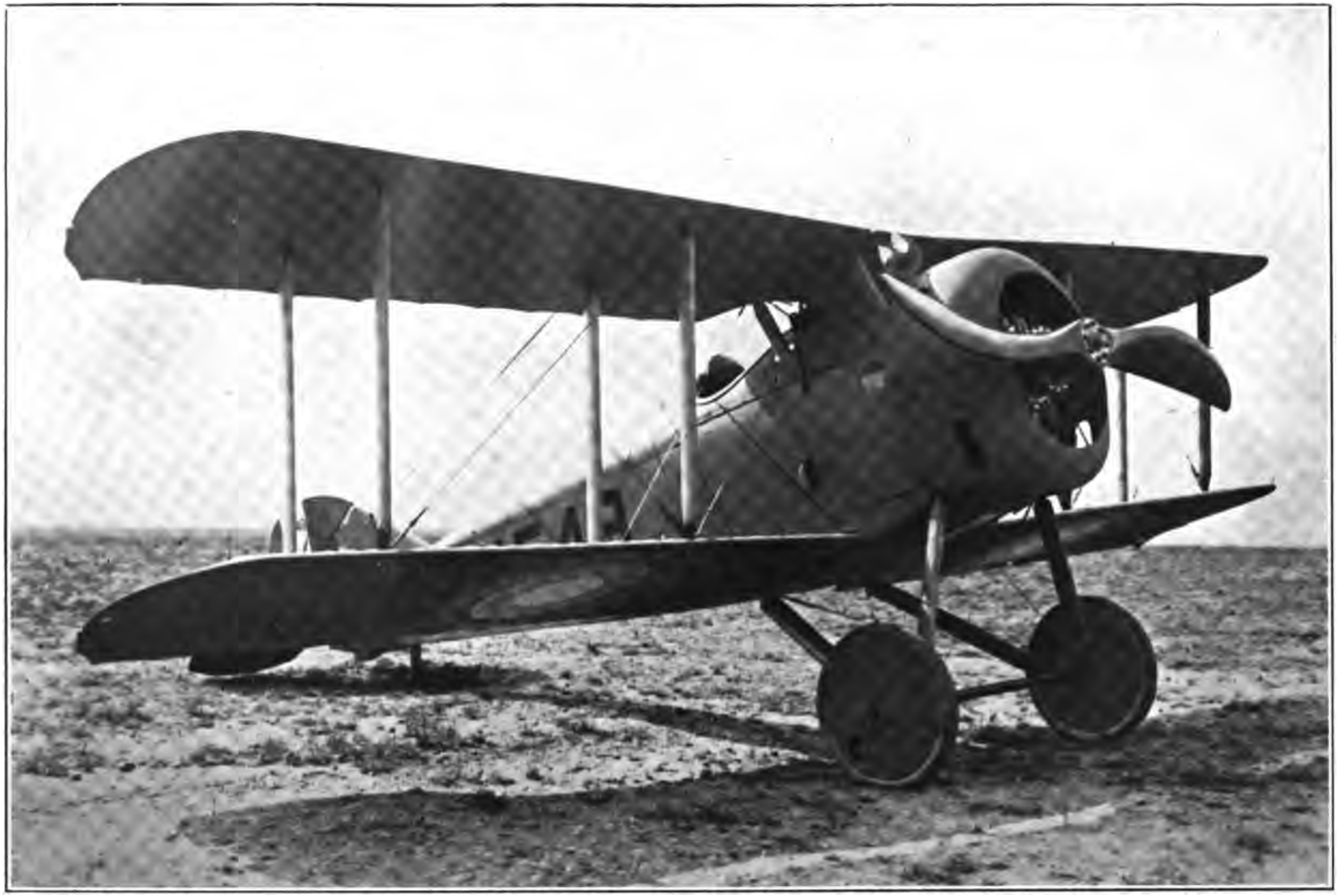
within a few days after the arrival of the medical officer the units were ready for work. By this method of decentralization the examination of thousands of applicants in a minimum time was made possible. Once it was assured that those charged with the responsibility of conducting the examination were fully equipped and capable of making the tests, full authority was vested in the medical officer in charge. Thirty-two military units, later established in the divisional camps of the United States, attended to the examinations of the enlisted applicants for air training. By far the majority of applicants were civilians, however, and the 35 original units in the cities, each examining from 10 to 60 applicants a day, soon provided the thousands of men required.

Attention should be drawn to the contribution to the Government war work represented by the vast amount of professional service rendered without pay by the civilian members of these units. These civilian consultants included many of the foremost specialists of the United States; were the services rendered by them to be represented in terms of Liberty bonds, the sum total would constitute a very respectable loan without interest. It is worthy of special mention that in addition to the routine examining work of the units, the members performed many hundreds of surgical operations enabling the applicants to qualify physically for this service, without cost either to the applicant or to the Government.

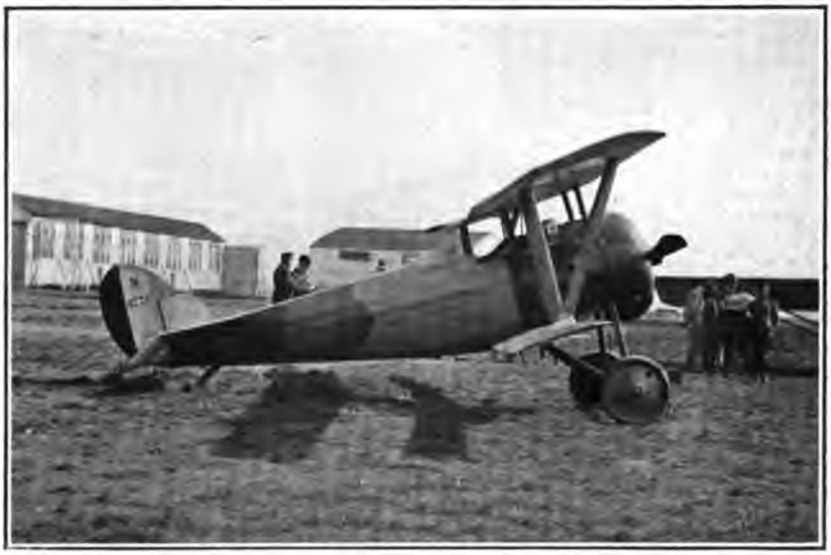
A public meeting was held in each city under the auspices of the medical profession of that city. The mere establishment of the units was by no means all that was accomplished by the work of the Medical Department. Throughout the United States there was no lack of interest on the part of the young men of the country to enter the flying service. There was, however, a striking need for authoritative information regarding the Aviation Service and how to go about getting into it. A by-product of the establishment of the units was the stimulation in each city of large public interest in this branch of the service. In one city after the meeting 95 men expressed their desire to enter this service.

In the rush of events after our entrance into the war not only was there a lack of information regarding Air Service, but there was a considerable amount of misinformation, most probably attributable to German propaganda. Throughout the country was spread the information that the average life of an aviator was only a few hours of actual service. Parents were given to believe that their sons were being taken for an almost immediate and inevitable sacrifice. Furthermore, there was not a city in the United States in which it was not firmly believed by the public that the much-discussed medical examination of an aviator was a form of refined torture. One story was that of the "needle test." This mythical examination was supposed to consist of placing a needle between the candidate's forefinger and thumb, blindfolding him, then shooting off a pistol behind his ear. The examiner would then nóte whether, due to his supposed lack of nerve, the applicant had pushed the needle through his finger. Another much-rumored test was described as follows: When the applicant least expected it he would be hit over the head with a mallet, and if he regained consciousness within 15 seconds he was qualified as being of the stuff of which aviators are made. It was the medical officer who could supply the needed information and also demonstrate the utter nonsense of this prevailing misinformation. In this way parents were assured by the Surgeon General that their sons were put through only an ordinary physical examination to insure their fitness for the service, and that for their own protection they would not be accepted unless physically sound. The mystery of the examination was removed by actual demonstration, aided by moving pictures.

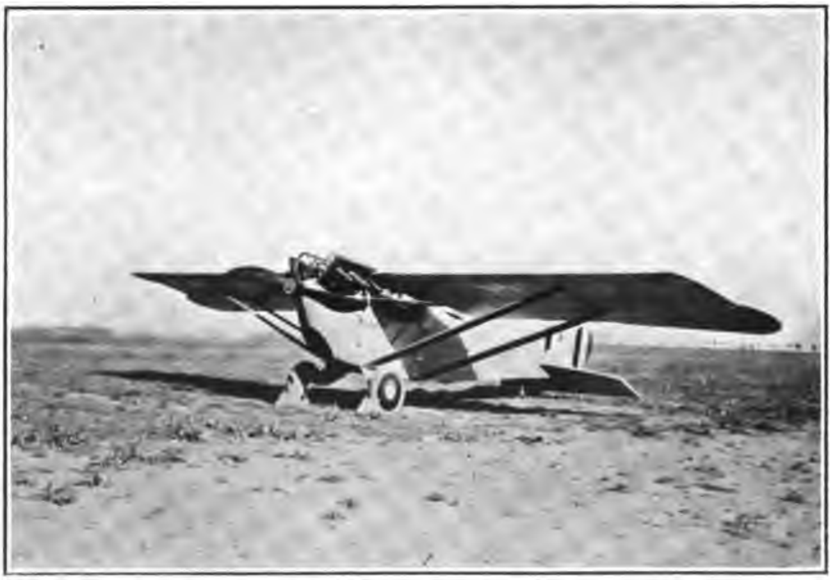
At these public meetings were gathered those of the medical profession and general public who were interested in aviation. The interest aroused within the medical profession by the work of the Physical Examining Units also resulted in bringing into the Air Medical Service a large number of specialists whose training in the examination of aviators fitted them later for a larger sphere of usefulness in the care of the flier.



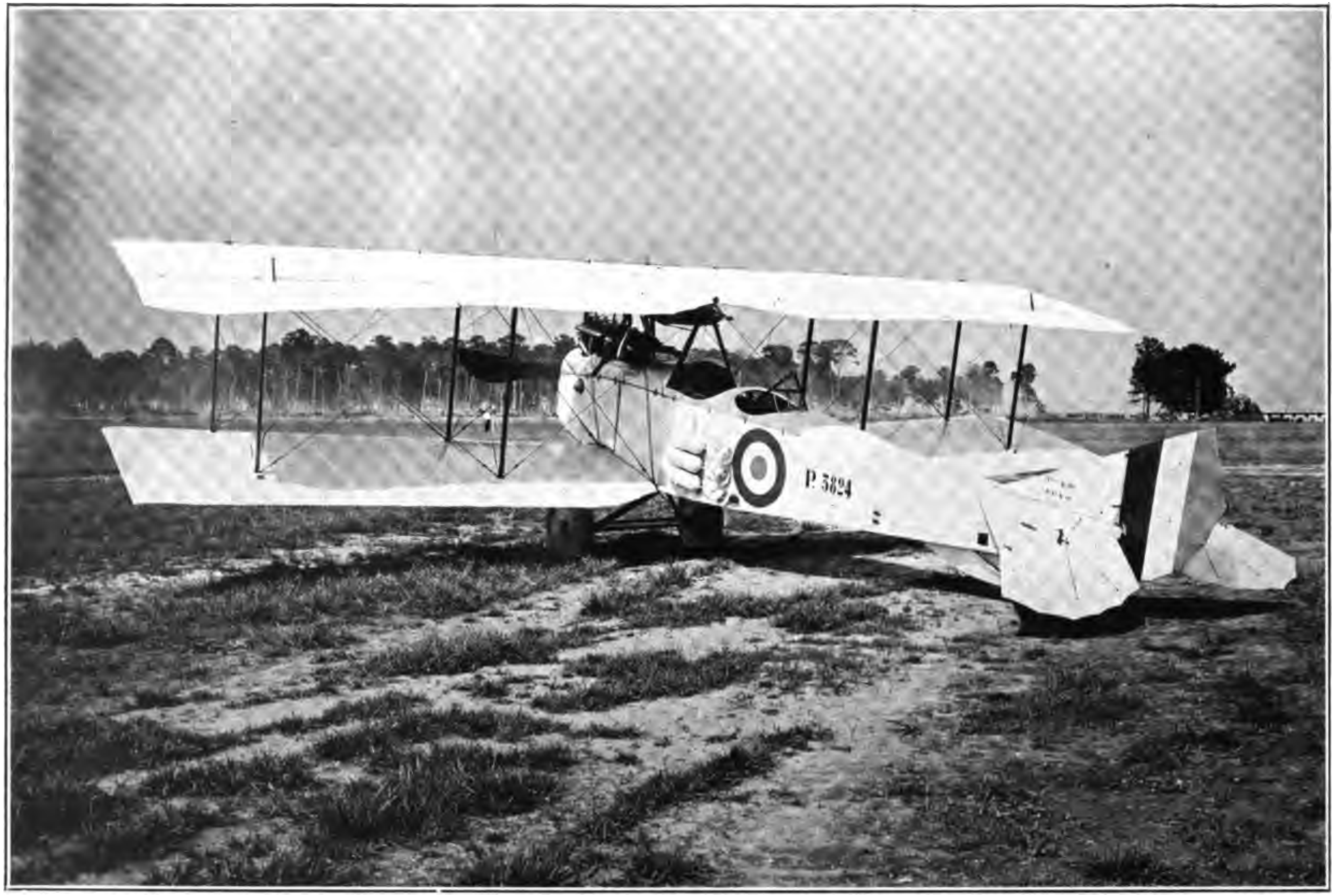
STANDARD SCOUT.



"NIEUPORT."

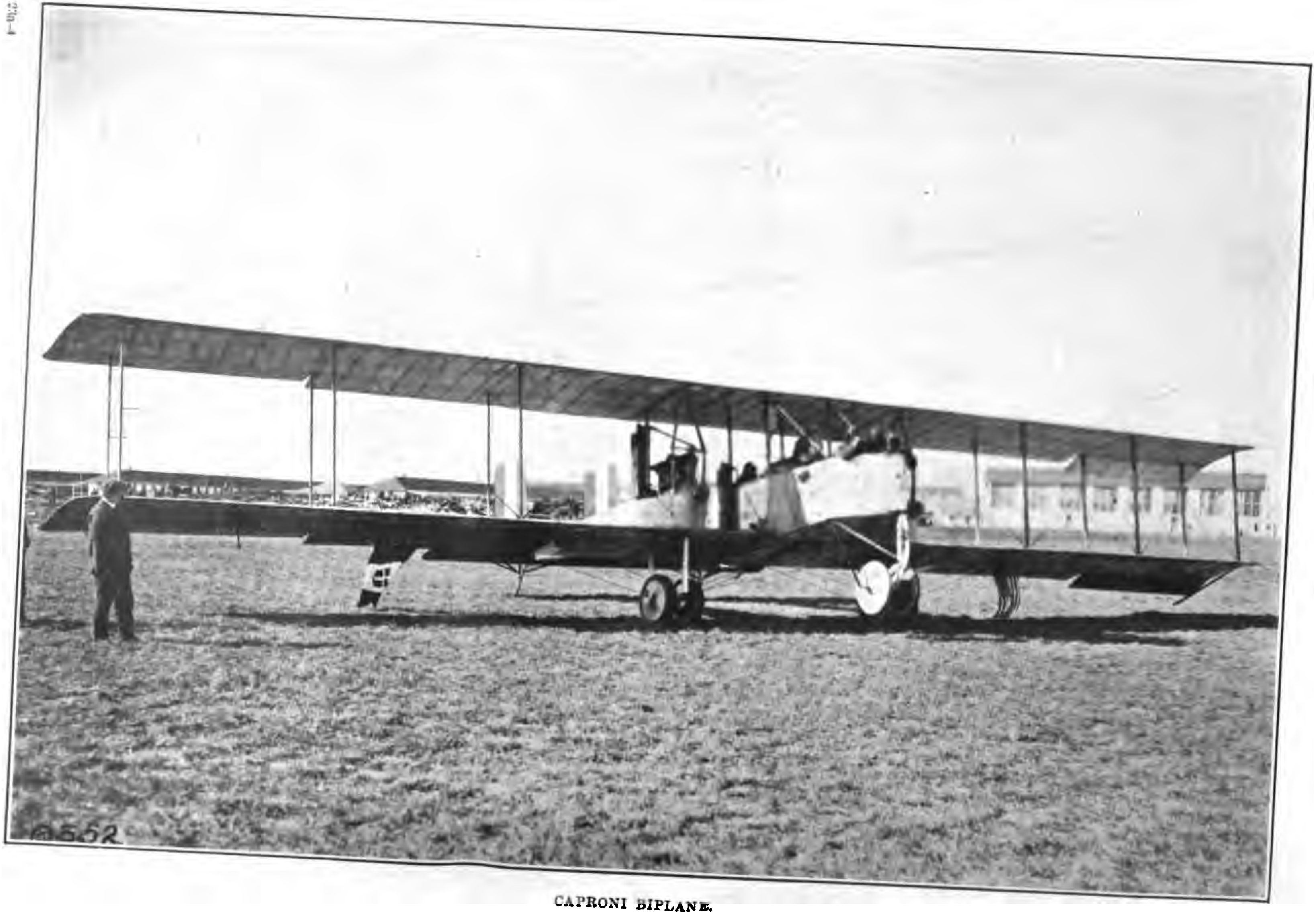


"LOENING MONOPLANE. HISPANO SUISA MOTOR."



BOMBING MACHINE.

A type of bombing machine. Pilots shown by medical research to be unfit for high-altitude work may be used in these machines, which fly at a comparatively low altitude.



CAPRONI BIPLANE.

CHAPTER III.

CLASSIFICATION.

The flier, who through good training has become perfect in his technique and who through proper care is physically fit, is not necessarily fitted for all types of air activities. When the present war first began, there were but few airplanes and what airplanes existed were used for all kinds of work. If an airplane and a man could stay in the air, they were used for any service which an emergency might call for. On one day the pilot might be asked to go across the lines on a reconnaissance mission and with the same machine, which was very limited in climbing ability and speed, he would be called upon the following day to go into the air to fight.

With the coming of improved designs and the more skillful managing of airplanes by fliers, different types of machines have become classified into special groups for special work. The flying service is now highly specialized. Men are called upon to perform widely diversified classes of work, such as pursuit or scout work, reconnaissance, photography, day or night bombing, artillery observation, and for each of these special missions the pilot is provided with a certain type of plane adapted to the work in hand.

Both the enemy and ourselves divide the machines used for service into two distinct classes; we have both the fighting machines which are a fast, quick-climbing type, easily and quickly maneuvered, and heavier machines which are slower in action and capable of carrying almost any weight.

It is easy to see that a fast-climbing machine is bound to carry the pilot to greater heights than the slow, weight-carrying machines. Whereas in 1915, flying rarely exceeded 8,000 or 10,000 feet, through improved designs scouts of to-day climb to altitudes even as high as 25,000 feet, and this height is attained in a very short space of time. The nature of the work of a scout, which is simply hunting out the enemy and attacking him, also necessitates descents from high altitudes at tremendous speed.

Night bombing has been carried out at altitudes as low as 300 feet. Day bombing, in order not to reveal the objective of the flight and to guard against concentrated anti-aircraft fire, may call for flights at very high altitudes. The possible necessity of attaining such altitudes presents a nice problem when we consider the weight of bombs which must be carried, together with the protective equipment with which the plane must be loaded. Reconnaissance machines rarely get to high altitudes owing to the necessity for more or less close observation of the ground, and machines doing this work must accomplish very low flying even in the face of highly concentrated anti-aircraft fire and enemy activity in order to fulfill their mission. Machines cooperating with the artillery which have to make range corrections for batteries do not often work above 6,000 or 8,000 feet. From this we can see that the machines doing the types of work just mentioned, except day bombing, fly very much lower than the pursuit or scout planes. With their capacity for carrying a larger amount of fuel, they can remain in the air for very long periods. When a long trip is to be made, such as a bombing raid far into the enemy country, at least four or five hours must elapse and the pilot is apt to be fatigued to the limit of his endurance. Especially is this the case in cold weather and under the long strain of an extended flight encountering anti-aircraft fire and enemy planes.

Pilots of scout machines, on the contrary, owing to the speed and climbing ability possessed by planes built for this type of work, never stay in the air much over two and one-half or three hours on account of being unable to load up their machines with more than a moderate weight of fuel. But they have to go to tremendous heights, they have to change those heights very quickly and very often, and they are subject to quick changes of temperature as well as sudden variations in oxygen content of the air.

In view of these facts the Air Medical Service realized the importance from a purely military standpoint of careful classification of fliers. The work of the Medical Research Laboratory has demonstrated that of each 100 carefully selected fliers only 61 are physically and mentally capable of attaining an altitude of over 20,000 feet with safety; 25 out of each 100 are physically and mentally unsafe at altitudes above 15,000 feet; and 14 out of each 100 are physically and mentally unsafe at altitudes above 8,000 feet. Or that 61 of the 100 are fit for any type of air work; that 25 may do bombing; that 14 should be limited to reconnaissance or night bombing. Such classification of pilots for specific duties constitutes a new factor of conservation and safety to our forces.

The feature of knowing the limitations of a valuable man spell increased efficiency.

Just as the pilot is provided with a certain type of plane adapted to the work in hand, so the plane must be provided with a pilot adapted to the work in hand.

It is true that in the absence of a pilot physically and mentally adapted for high-altitude work it is possible to use one who is adapted only for low-altitude work by equipping him with an apparatus to supply oxygen according to his needs. Supplying oxygen to fliers has been a subject of much experiment and study during the past two years both by the enemy and by the allies. The British have used an oxygen apparatus of satisfactory type for two years—the Dreyer Apparatus. This type of apparatus is being produced in the United States in increasingly large numbers, and at the same time modifications and improvements are being constantly made. In the very nature of things, however, it is impossible to count upon adequate and ready-to-serve oxygen supply for each aviator in each machine which emergency may send into high altitude. Until the final absolute perfection of oxygen apparatus for the flier and the equipping of each high-altitude plane has been accomplished, cognizance must be taken of altitude rating of the flier in "selecting the man for the job."

Physiologic studies on men undertaking to live at high altitude, such as Pike's Peak, have proven that a very complex series of changes occur before their bodies become able to live normally with less oxygen. This is acclimatization, and this occurs in the man living on Pike's Peak, but not in the aviator who alternates constantly between high and low altitudes.

The flier must undergo abrupt changes in atmospheric pressure and oxygen supply. Atmospheric pressure plays a very unimportant rôle; the whole problem resolves itself into a deprivation of the normal oxygen supply. The fact that there is "oxygen-want" at high altitudes suggested that any piece of apparatus that would permit the breathing of a reduced amount of oxygen could be used to test the ability of men to withstand high altitudes. The Flack bag was the prototype of the rebreathing apparatus which has been developed in the Medical Research Laboratory and perfected for such tests. By means of this apparatus the aviator rebreathes air confined in a tank, from which he gradually consumes the oxygen. As the percentage of oxygen decreases the aviator, in effect, is slowly ascending to higher altitudes. In the course of 25 to 30 minutes he lowers the oxygen content of the air in this tank to 8 or 7 per cent, which is equivalent to attaining altitudes of 25,000 to 28,000 feet.

Another method of attaining the same result is by means of the diluting apparatus, which supplies directly to a mask over the face whatever proportions are desired for a mixture of air and nitrogen. All of these tests have been standardized and confirmed by the low-pressure tank, in which the air is rarefied to correspond to any given altitude.

By a comparison of the percentage of oxygen to which the aviator succumbs when on the low-oxygen tests it is possible to determine precisely the altitude at which the aviator would fail were he in the air. This determination is made on the ground, without danger either to the aviator or to his machine, and has been taken as the basis for the classification of aviators now in use by the Medical Research Laboratories.

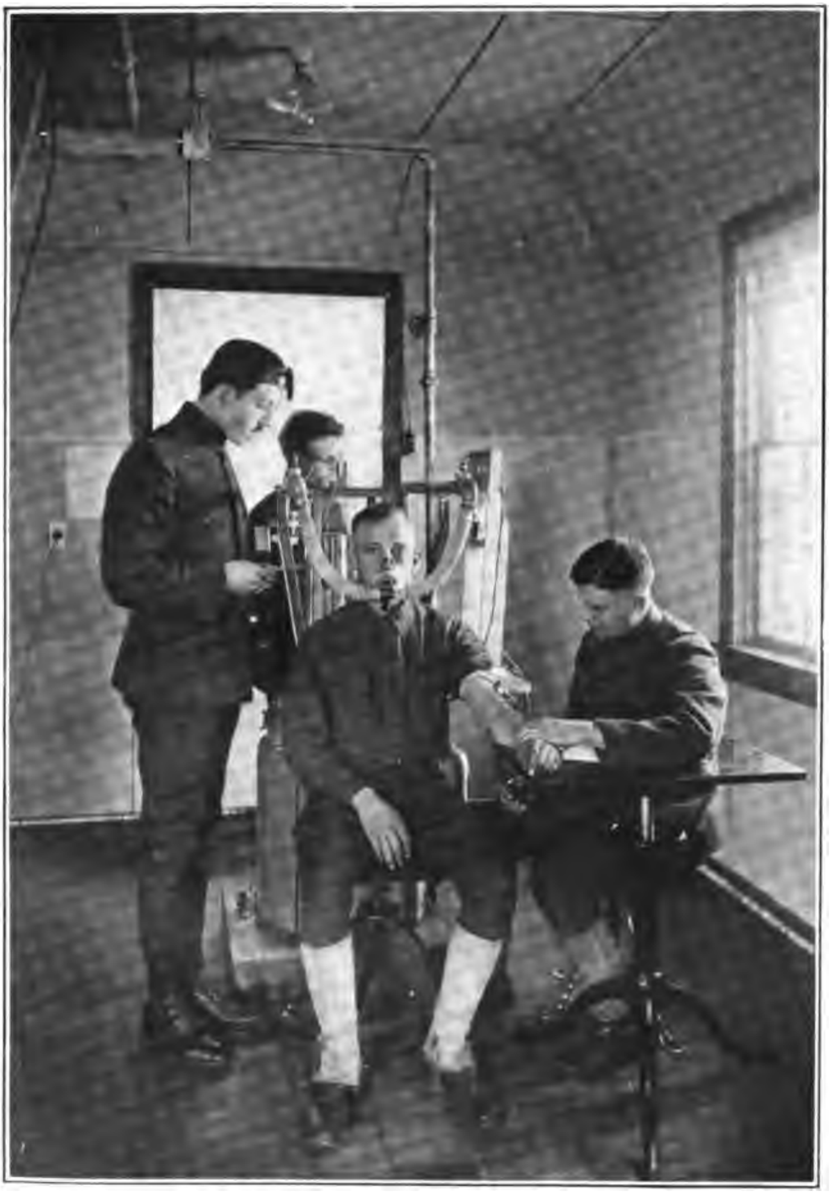
It may be noted that these tests of the ability of an aviator to withstand oxygen reduction could not be made safely in the air, as the effects of oxygen-want are insidious and often the aviator succumbs very suddenly and completely when his limit is reached.

The effect of low oxygen upon the mental processes of the aviator varies greatly in the individual. The aviator usually becomes mentally inefficient at an altitude at which there is as yet no serious failure of his vital bodily functions. If he were sent to an altitude which his heart could safely stand, his efficiency would nevertheless suffer because his brain is not acting properly. By simple tests of mental alertness during rebreathing it is easy to determine that one flier becomes mentally inefficient at 15,000 feet, in sharp contrast to another aviator who has his full mental powers up to and beyond an altitude of 25,000 feet.

Low oxygen has a marked effect upon vision. Oxygen-want exaggerates to a marked degree any existing defect of the eyes. In many young healthy men the rebreathing tests made manifest eye defects which may have eluded detection by the most expert examination. Crash reports have demonstrated that a large proportion is due to such eye defects. Again, in night flying it is most important that the flier shall be able "to see well in the dark." Many aviators are able to fly well without any difficulty in the daytime, but not at night. Laboratory tests determine definitely which individuals possess the ability to see well at night.

"Stunting" is essentially an internal-ear problem. During and after rapid turnings the flier's brain is receiving impulses from his semicircular canals. Nothing can control or alter the sending or receiving of these impulses. These impulses produce sensations of motion. Fliers vary greatly in their ability to interpret correctly the significance of these impulses. Experience alone enables the aviator to familiarize himself with the meaning of these impulses; those who develop the greatest ability in this respect naturally fall into the scout-pursuit class. Those who, in spite of training, are still disturbed or bewildered by stunting should be reserved exclusively for straight flying, such as bombing and photography. Again, the peculiar demands of night flying, reducing, as it does, at times to the vanishing point, information coming from the eyes, require a type of flier who possesses the keenest ear sense for the detection of movement.

The rebreathing test is also very valuable in determining staleness in aviators. As staleness is caused by frequent exposure to high



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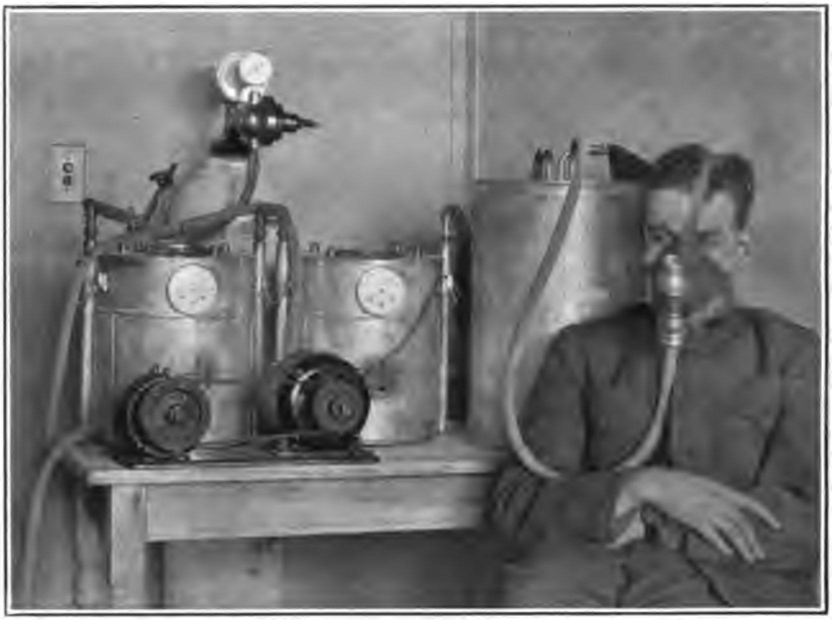
RE-BREATHER.



DREYER DILUTING APPARATUS.

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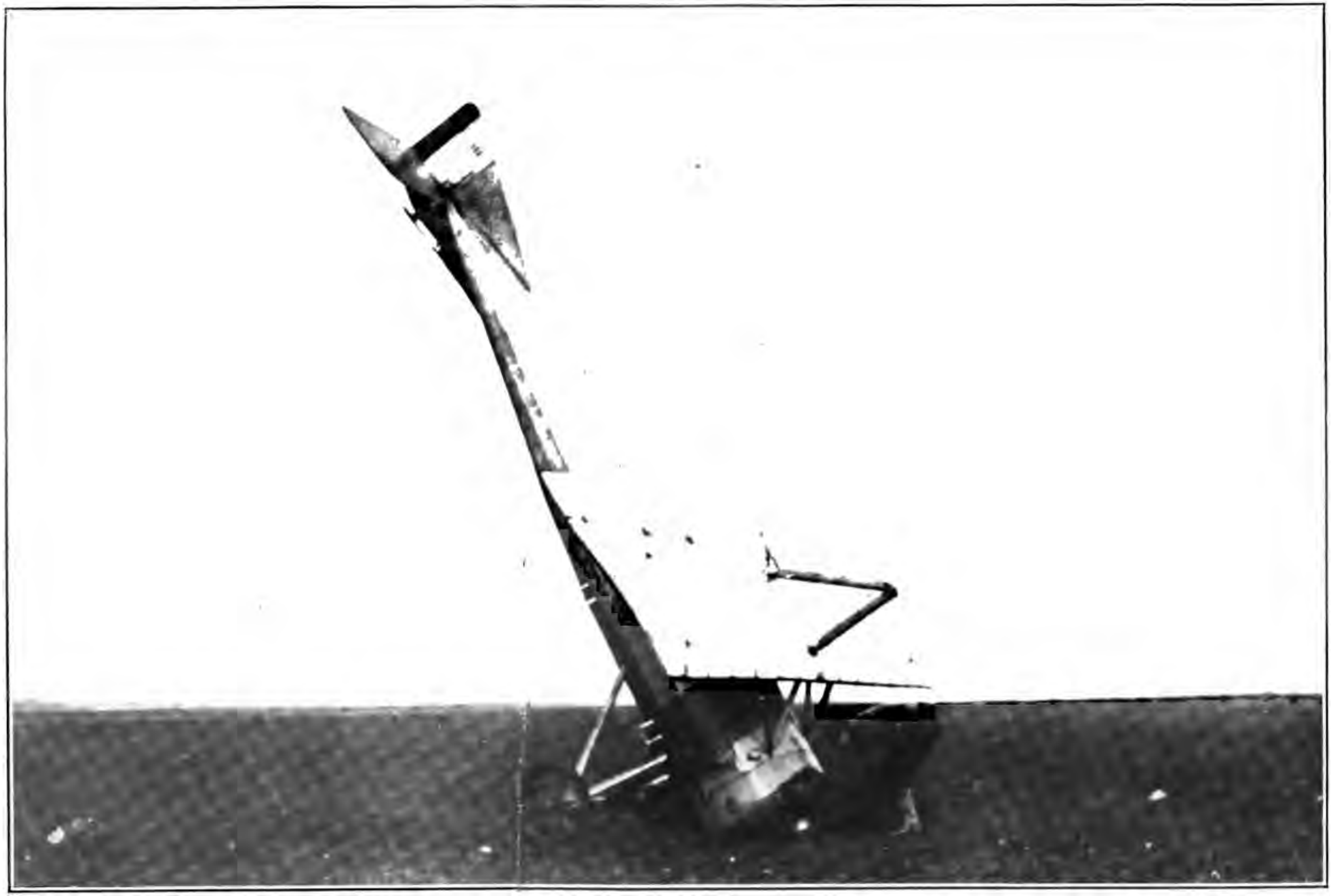
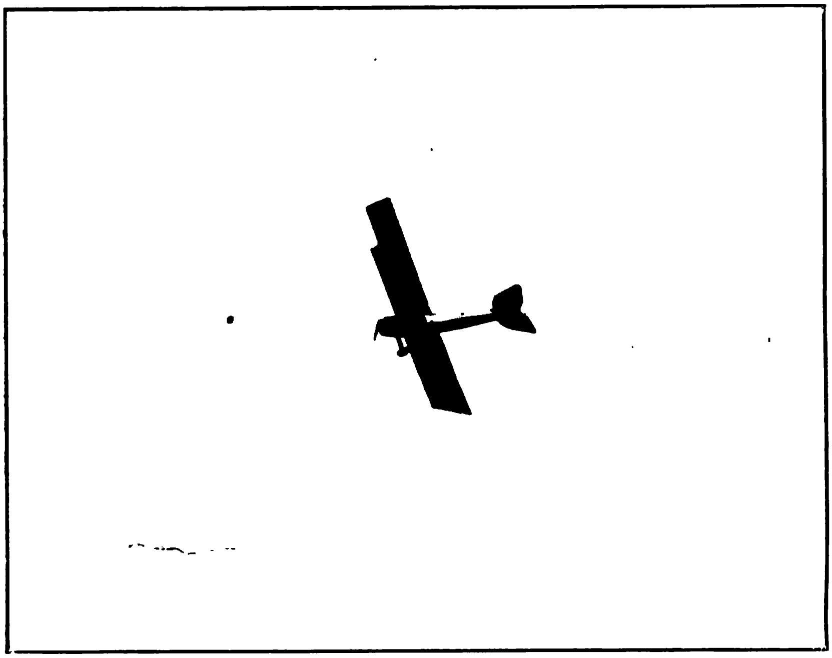


A GRASS CUTTER COME TO GRIEF.

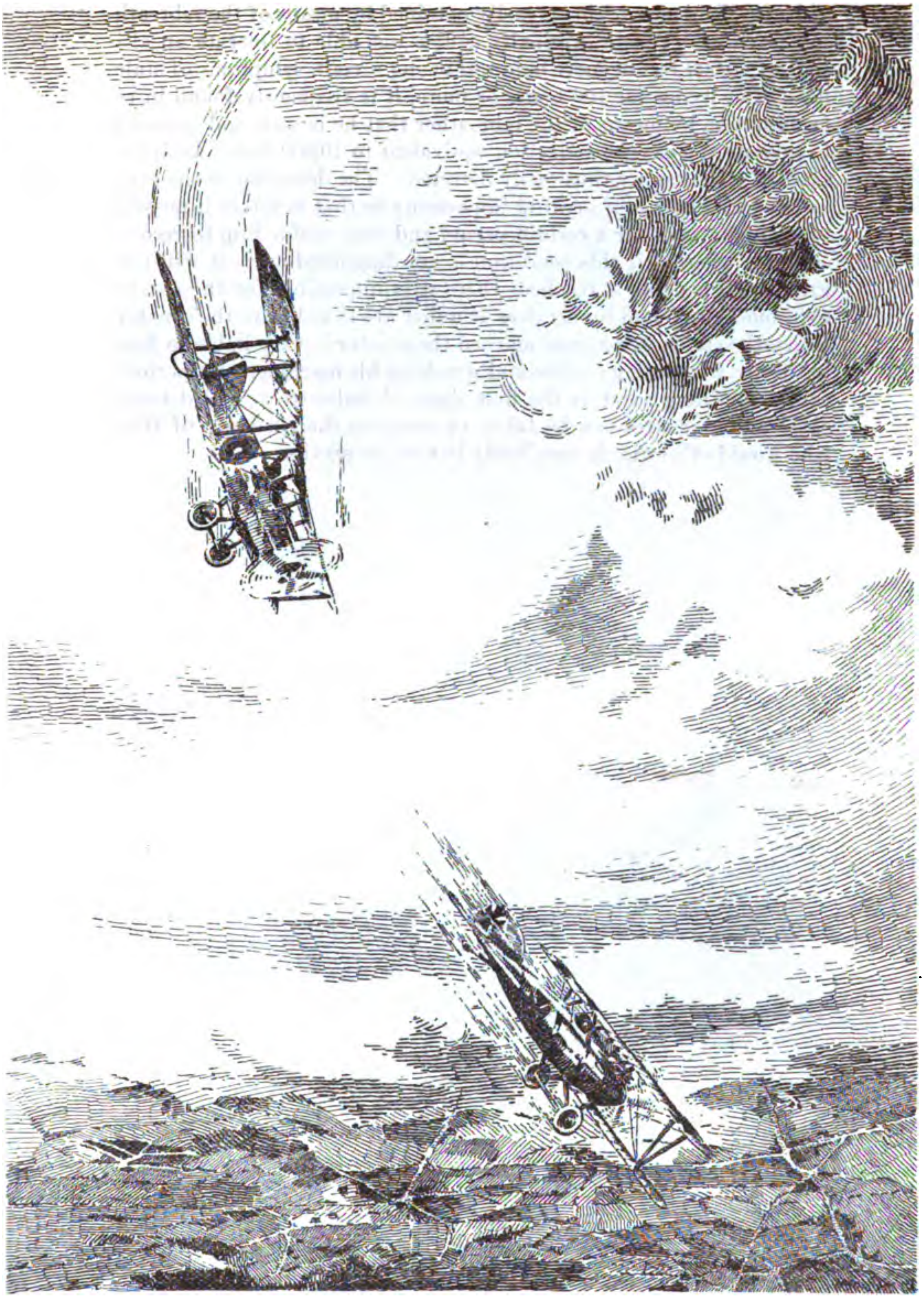
Deficiency in vision is responsible for poor judgment in landing. Accidents such as this can be diminished in number by eliminating defects and deficiencies in pilots through most careful and continuous medical supervision.



VERTICAL BANK. SIDE SLIPPING—2,000 FEET IN THE AIR.

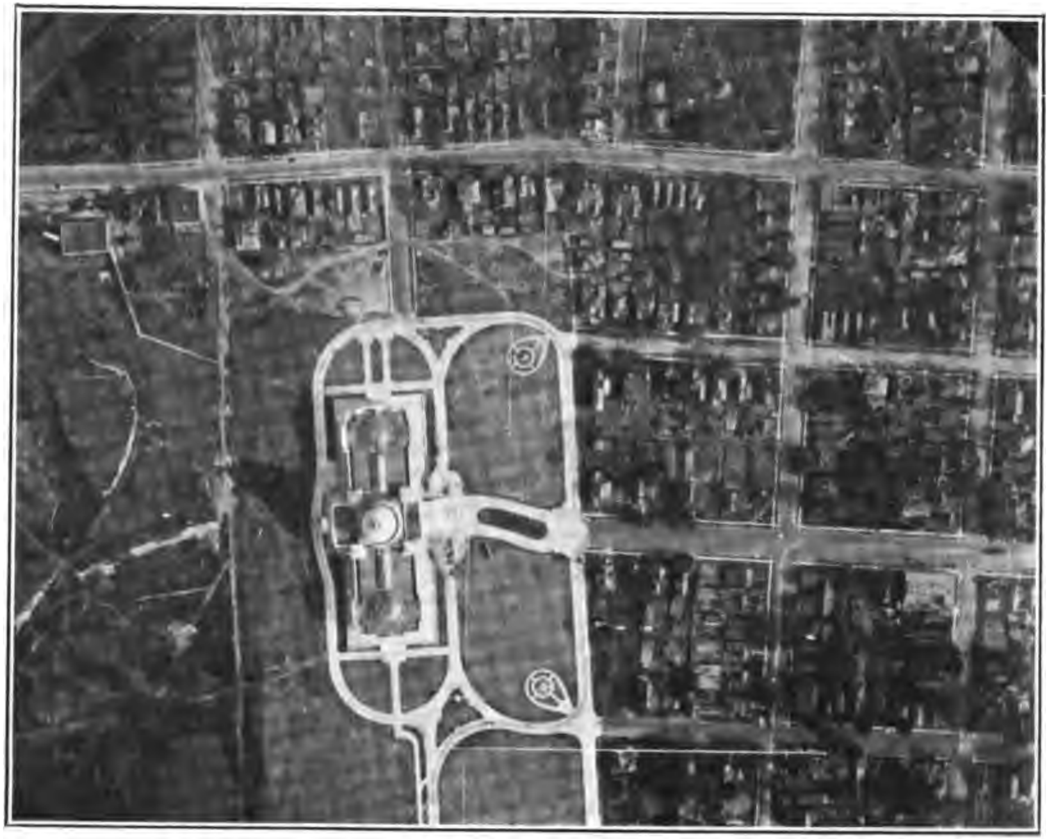
Poor balancing ability can thus endanger pilot and machine.

26a-4



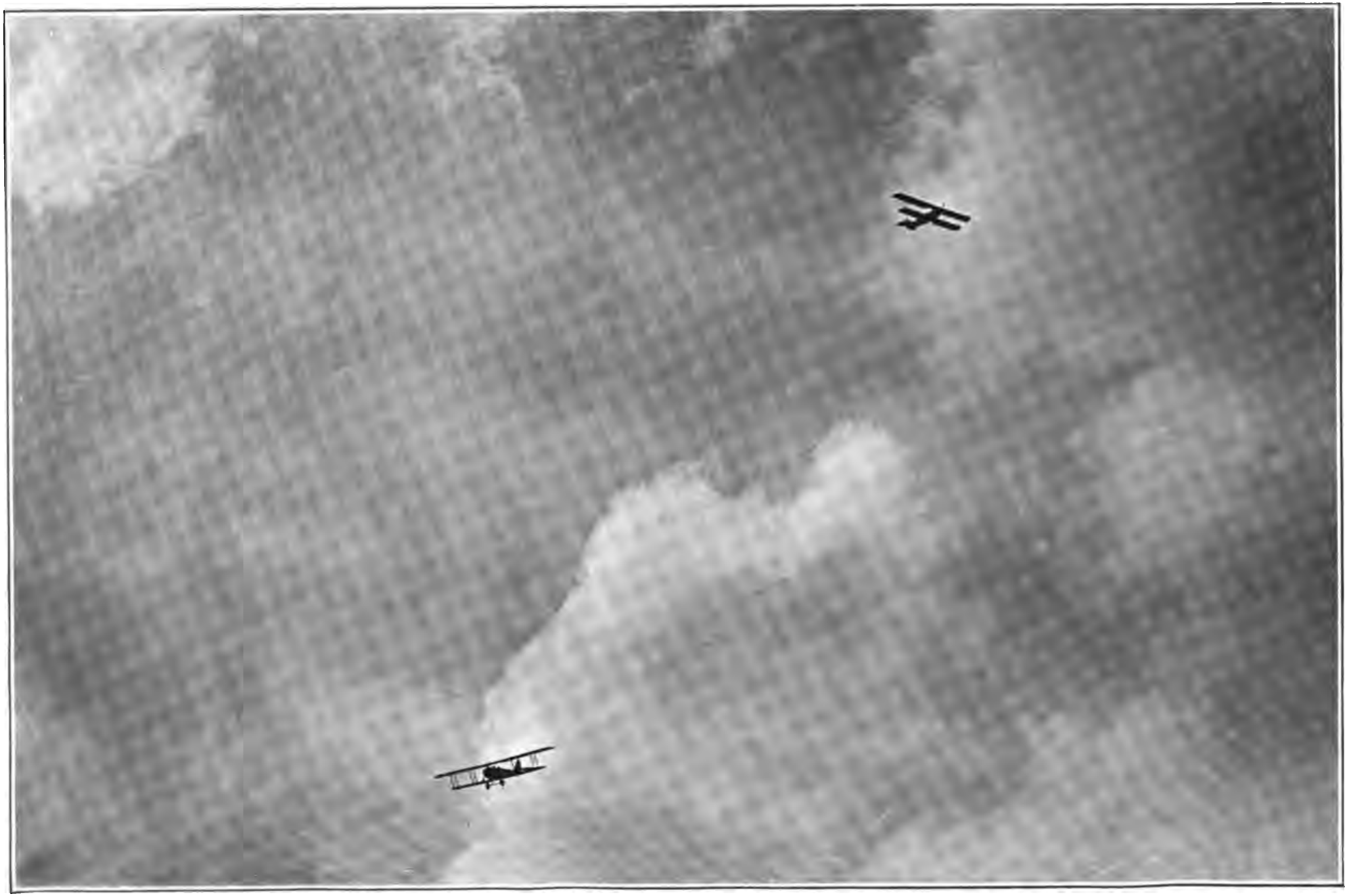
THE CHASE.
A critical moment when the nervous system should be in good order.

altitudes, evidence of this is easily obtained by means of the rebreathing machine. Where originally a flier was able to tolerate an altitude of 20,000 feet or more before showing certain symptoms of staleness, after flying for 100 hours or more, it is frequently found in reexamination by means of the rebreather that he is stale and is unable to tolerate the oxygen reduction equivalent to 10,000 feet. Incipient cases of staleness are thus easily detected. The detection of the early cases of staleness is of greatest importance in that it makes it possible to ground a man for a certain period and thus enable him to recover entirely, whereas if this condition is not diagnosed early it will progress until a point is reached where it is impossible for the aviator to " come back " and his services as a flier are thus lost to the country. When the staleness becomes marked the aviator is very liable to faint in the air, thus losing his life and wrecking his machine. By periodically examining aviators the first signs of staleness will be detected early and measures can be taken to conserve the efficiency of those who would otherwise be inevitably lost to the service.

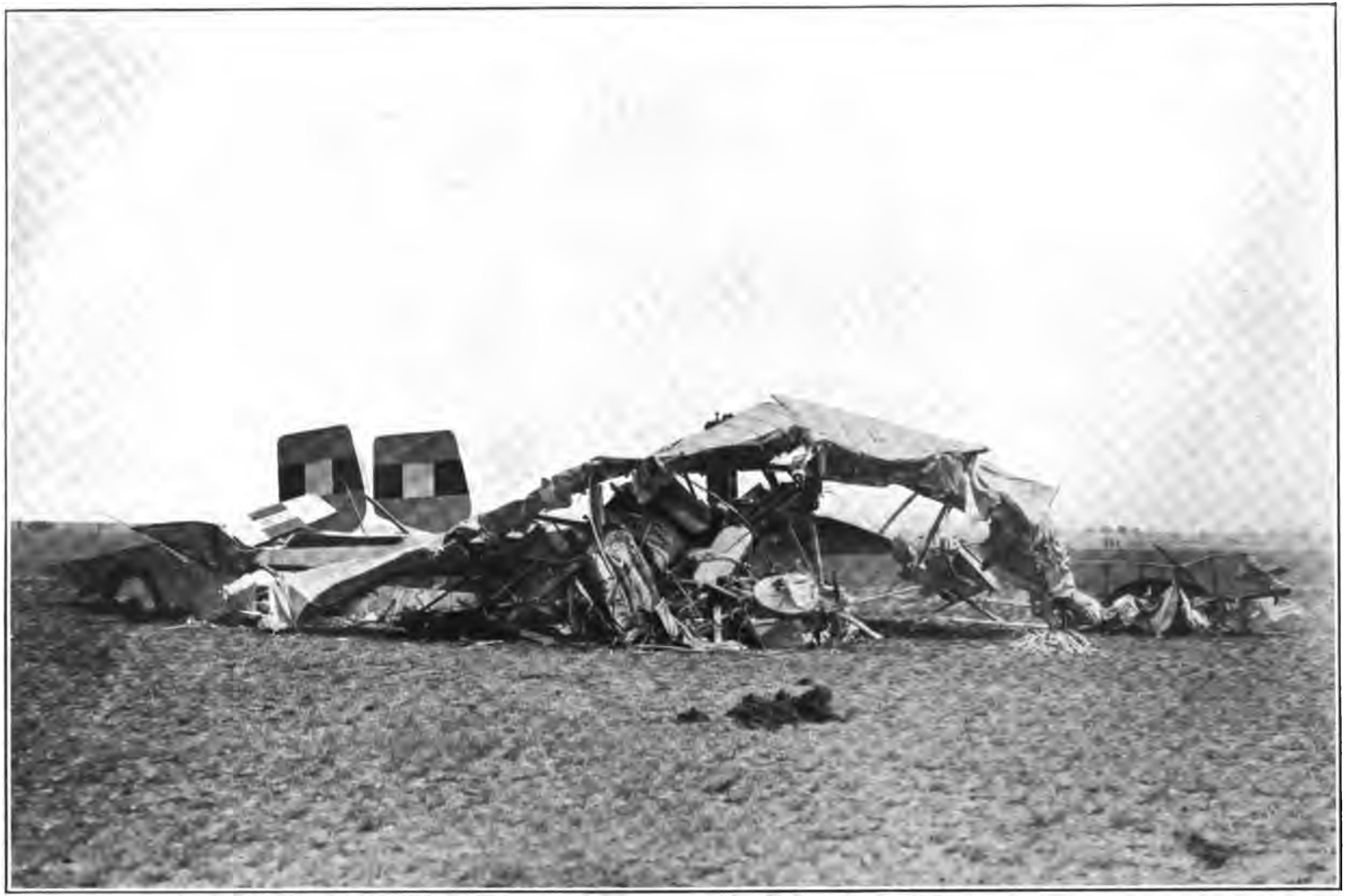


VIEW FROM AN AIRPLANE.

A portion of Little Rock, Ark., showing State Capitol. 4,000 feet altitude.

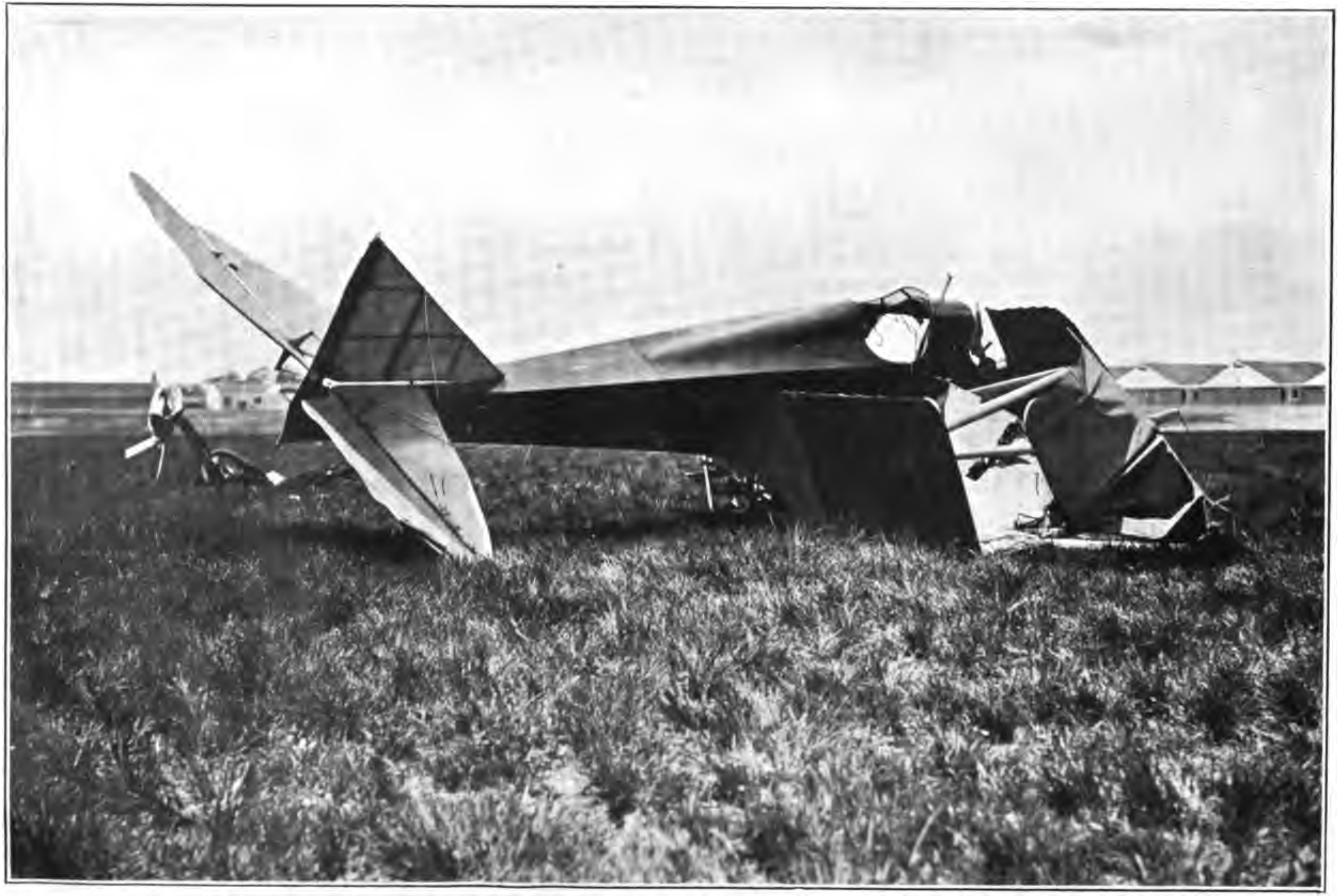


PLANES FLYING HIGH UP AMONG THE CLOUDS.



RESNATI CRASH AT MINEOLA.

This great flier was sick, and he had been urged not to fly by one of our Flight Surgeons.



GINO CRASH AT MINEOLA.

CHAPTER IV.

THE FLIGHT SURGEON.

The Flight Surgeon constitutes the ultimate "answer" to the maintenance problem of the Air Medical Service.

In the foregoing chapters has been presented the work of the selection of the aviator and of the classification of the aviator. The Air Medical Service, however, does not end here. It is all very well to have chosen with great care those hand-picked men who constitute our Air Force and, thanks to the enormous number of applicants, to have adhered to the highest standards in their selection. It is all very well to have medical specialists classifying fliers and determining their peculiar fitness for special branches of aerial activity. This, however, by no means marks the limit of usefulness of the Air Medical Service. The one immediate need of the military aviator in all the services of the world is an organization for his upkeep and care in actual service. After two and one-half years of bitter experience it was gradually borne in upon the allies that at the end of a certain amount of continuous service the flier begins to show unmistakable signs of deterioration, and the economical thing to do is to relieve him temporarily from active flying. This was a new thought in aviation. Up to that time it had been the practice to keep the flier at it until he broke. His breaking was signalized sometimes by simple failure to return from behind the enemy lines; sometimes by becoming mentally and nervously so exhausted as to be of absolutely no use; at other times becoming so physically worn out that even the casual observer would recognize his unfitness for service.

The old method was to get as much out of a flier as possible, then discard him as useless for further air service. The alumni of this old school, although not all present, because of the graduation of so many behind the enemy lines, are now represented by the hundreds of "washed out" fliers from the Italian, French, and British services that one meets in various ground activities in the flying schools of America and Europe.

Many of these are unnecessarily wasted. Their loss to active service could have been materially reduced by means of competent medical officers who, recognizing the early beginnings of deterioration, could have taken them off in time to permit full recuperation and restoration to active flying.

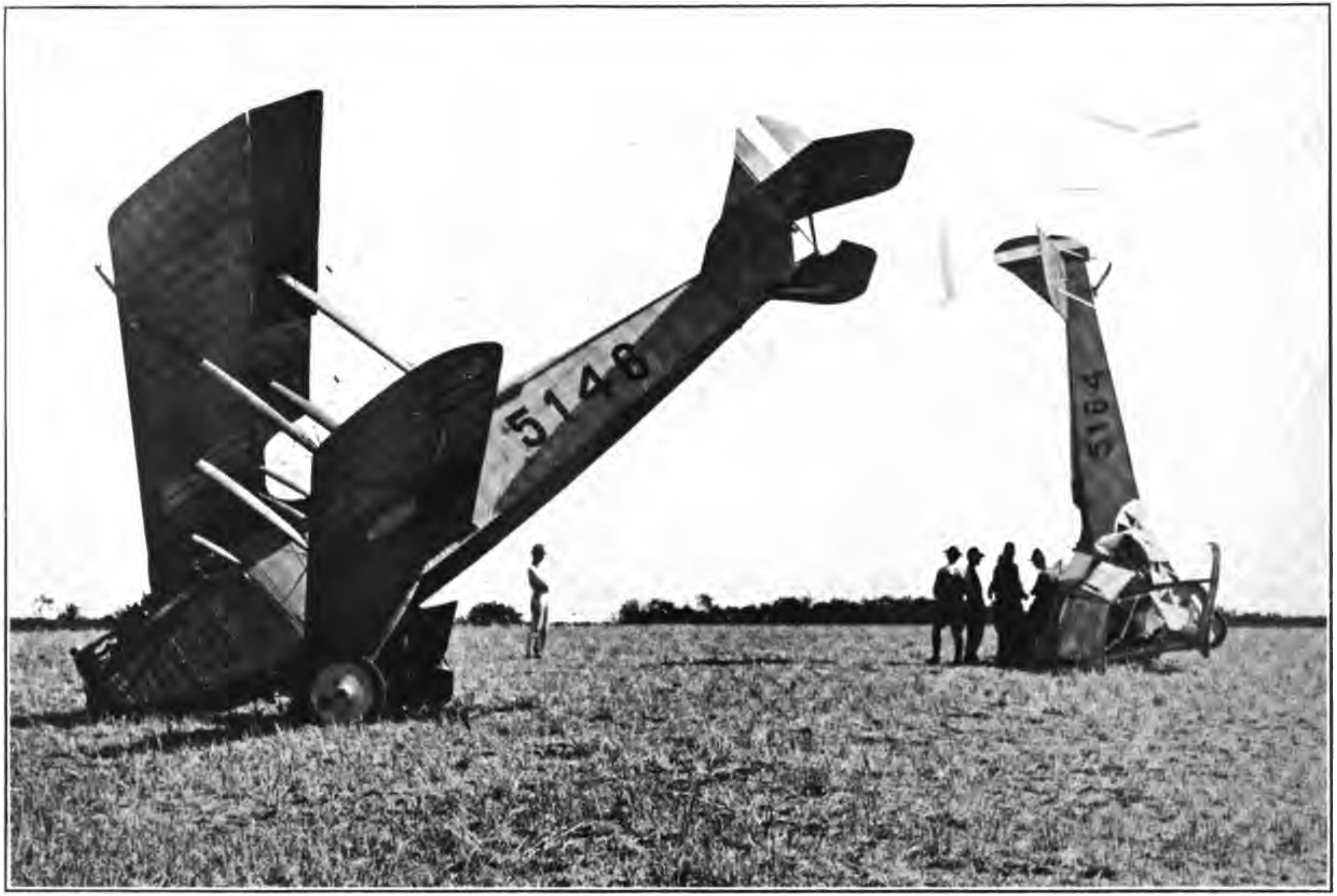
It is easy to sum up the various means by which a flier's usefulness may be terminated. They are exactly three:

(1) The Hun.
(2) Failure of the engine or plane.
(3) Failure of the flier himself.

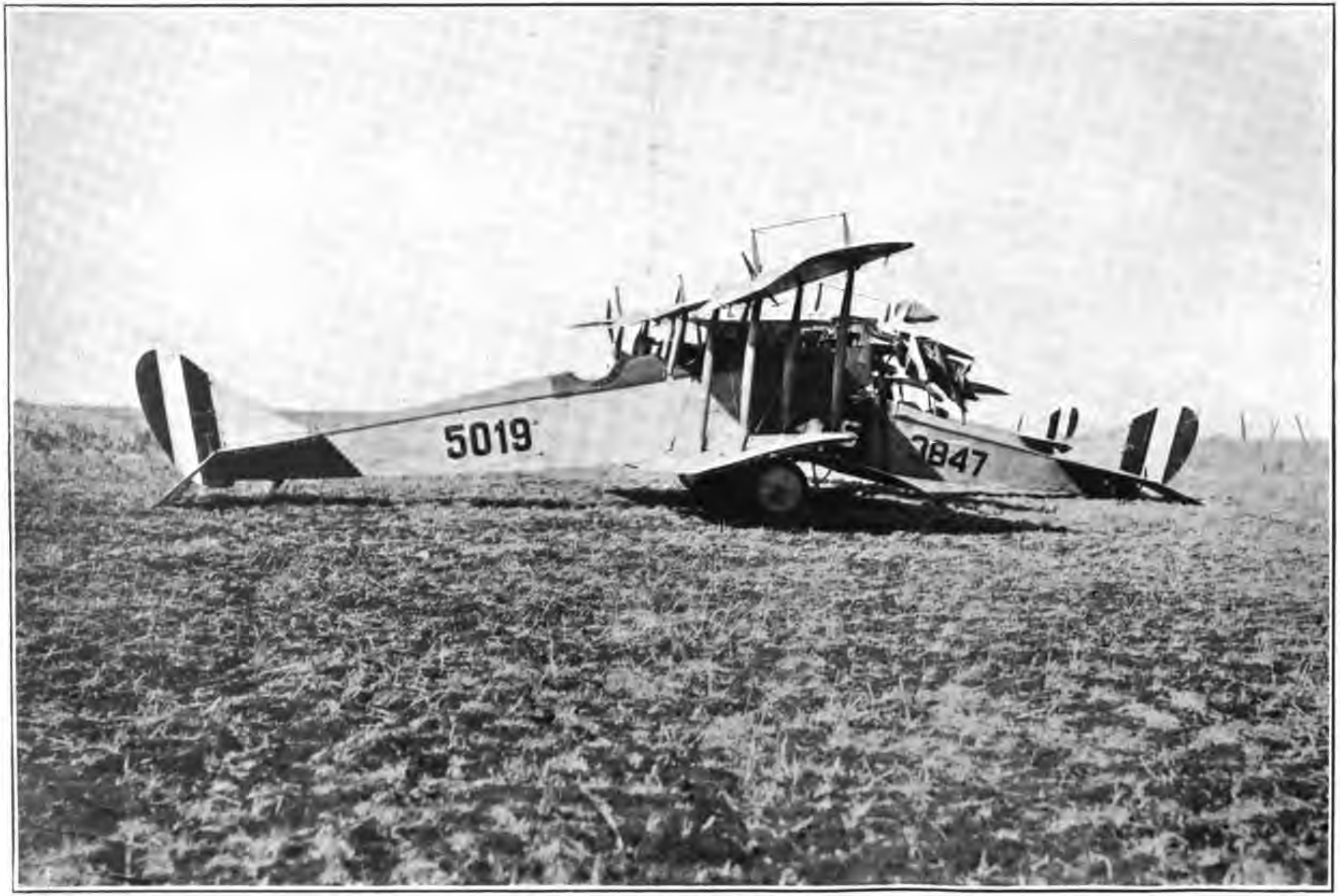
While it is not possible to arrive at exact percentages, estimates based upon information from every source in Italy, France, and Great Britain, interviews with commanding officers and medical experts in all the flying centers and at the various fronts, indicate that not 2 per cent of the fliers lost to active service are put out by the Hun. Failures of the airship are, at the present time, responsible for very limited losses to the service, thanks to the inspections to which they are constantly subjected. Two years ago this statement would not have been true; the mechanical genius of the world has been applied to make the airplane safer and with such effect that it happens only rarely that the flier becomes useless through the fault of the ship. Statements from all sources agree that of the total number of fliers permanently out of flying service, not over 8 per cent have been rendered unserviceable because of mechanical shortcomings of plane or engine. When it has been stated that 2 per cent of the total number of fliers incapacitated for further air service are put out by the Hun, and 8 per cent because of mechanical shortcomings of the airplane, the remaining 90 per cent looms large, when it is realized that this proportion represents troubles in the flier himself.

After assembling all possible information, subjecting it to careful study by competent experts and reaching definite conclusions, the material so obtained has been put into shape for further training of a corps of medical officers who have had opportunity to become familiar with the Air Medical Service by actual experience in the examination of applicants, the post-surgeon work in flying fields, and the reexamination of fliers. This is the epitome of the development of the flight surgeon idea. Through such a corps of officers, established in the various flying fields, practical application can be made of means and methods devised for the better maintenance of the physical efficiency of the flier. Just as the Medical Department of the Army has been able to wipe out typhoid fever, and made it possible to construct the Panama Canal by the elimination of yellow fever, so the Air Medical Service is destined to serve by prevention of the crash rather than by "picking up the pieces" afterwards.

Medical officers of the various air services had observed that more than half of the injuries sustained in crashes were caused by the aviator striking his head against the cowl. It was suggested that the cowl be cut out so as to give 8 inches more room in front. A

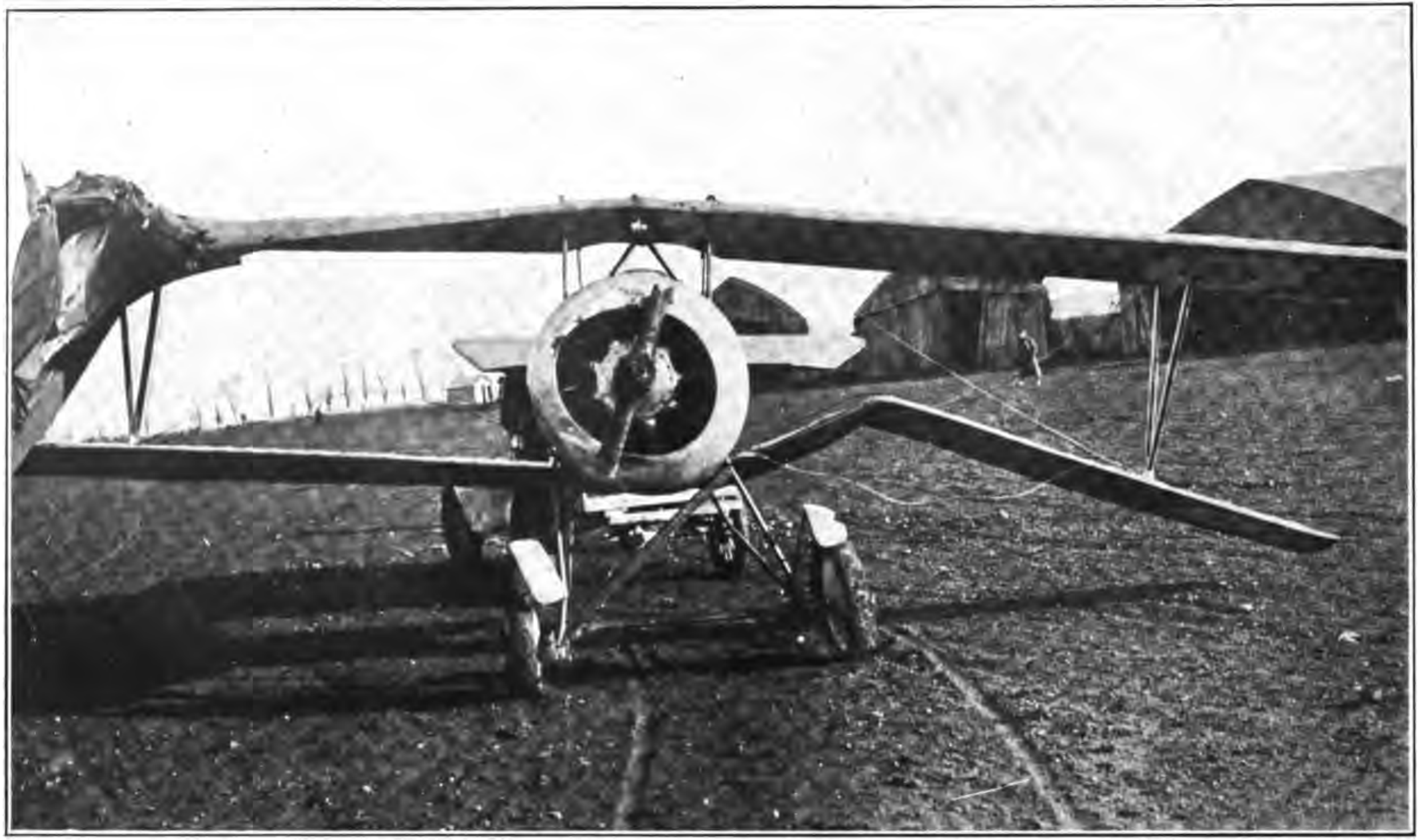


RESULT OF COLLISION IN AIR.



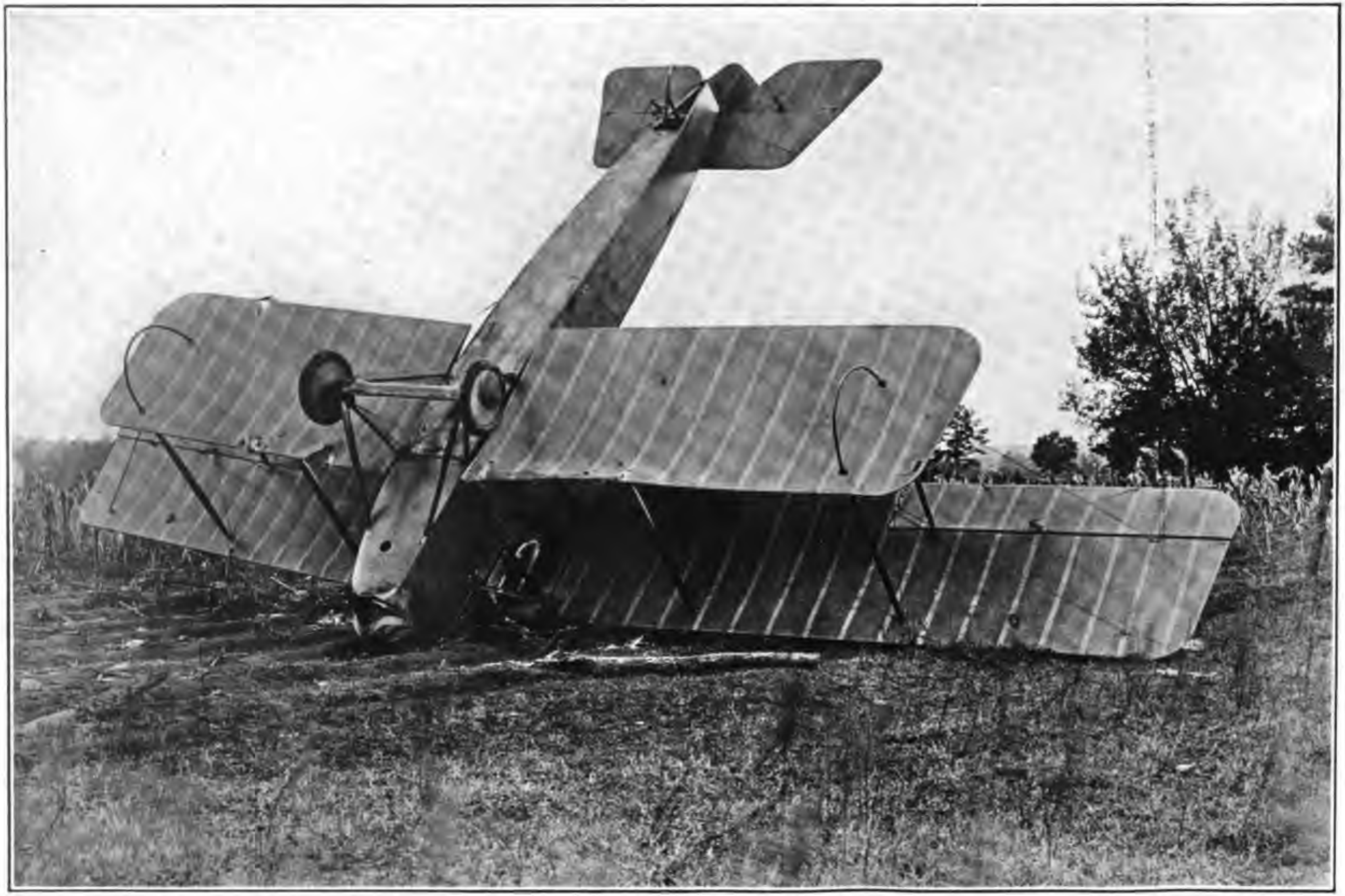
COLLISION ON GROUND (TAXIED TOGETHER), AIR-SERVICE FLYING SCHOOL, RICH FIELD, WACO, TEX.

Ships 5019 and 3847 taxied together. Picture submitted in connection with report



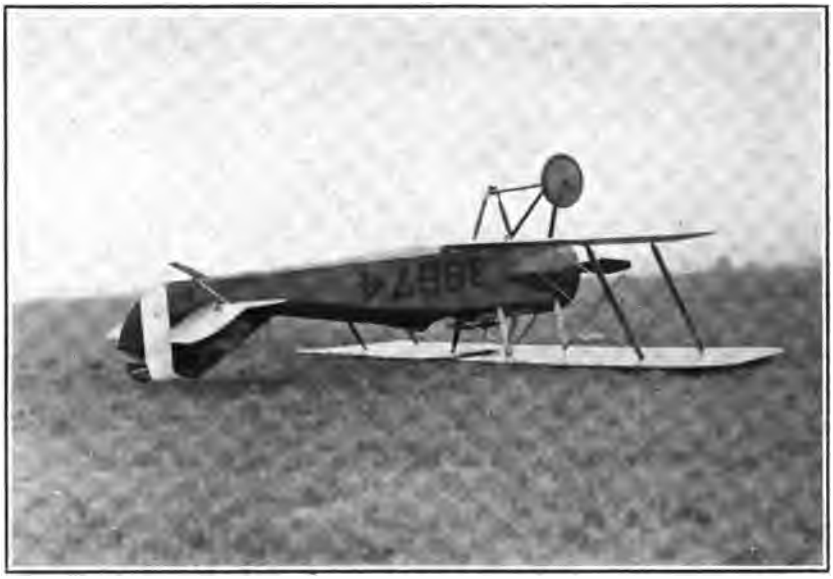
VIEW OF PLANE AFTER HAVING DROPPED 500 FEET.

Only 8 per cent of these accidents are due to defective machines; 90 per cent are due to imperfections in pilots. We must decrease the number of accidents.



AIRPLANE AFTER TURNING TURTLE.

Poor judgment nine times out of ten is responsible for such accidents. The need of the pilot, for careful inspection and supervision, is nine times as great as is that of the airplane itself.



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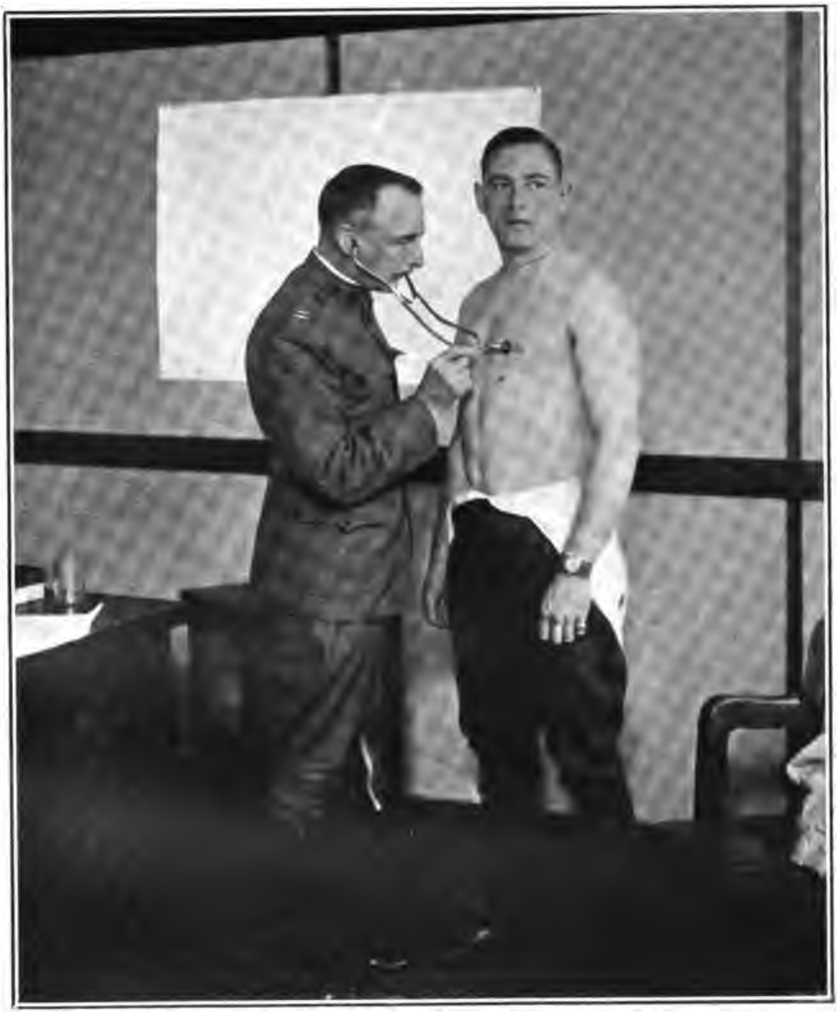
STAFF OF MEDICAL



EXAMINATION OF FLIER.

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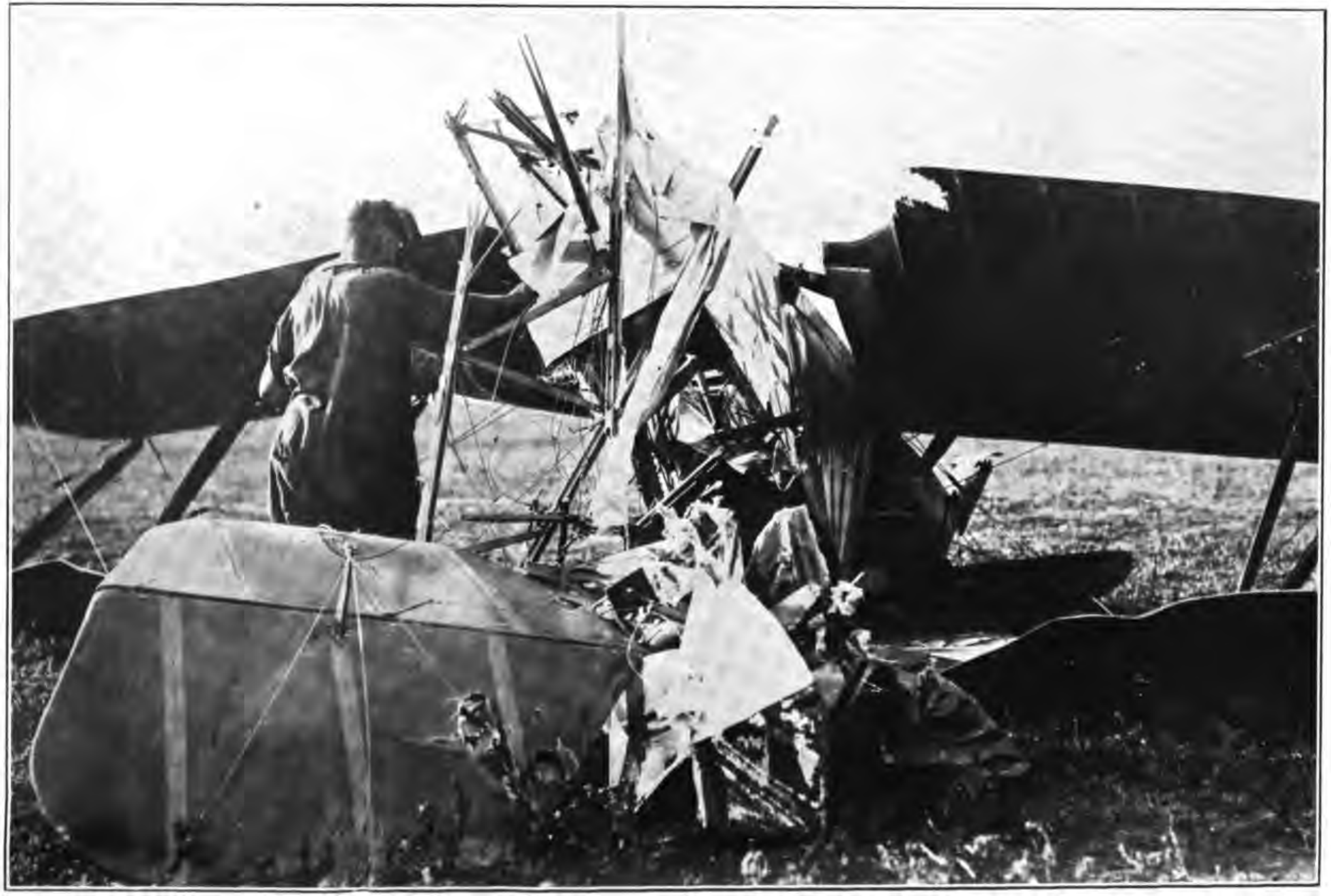

COLLISION—300 FEET ALTITUDE

MAJ. HITCHCOCK IN PILOT'S SEAT.

30a-9

DECOYED.

report just received from the Royal Air Force, Canada, states that since this change in the cowl has been made these head injuries have been practically eliminated. Another suggestion was to lash the safety belt to the machine by a simple rubber shock absorber; the same report states that since this has been done, the number and extent of injuries to the upper abdomen and ribs have been decidedly reduced. The problem of protecting the flier against the extreme cold of high altitudes in winter was solved by designing electrically warmed clothing, thereby enabling him to continue his flying under conditions, which, up to that time, had rendered it impossible. The problem of enabling a flier to withstand the glare of reflected sunlight above cloud banks and to enable him to pierce camouflage was solved by furnishing him with the "Noviol" type of goggles. During the first two and one-half years of the war no attempt was made to compensate the flier for his lack of sufficient oxygen in high-altitude work. There is one British squadron which has used the Dreyer oxygen apparatus since January, 1917; a recent report from the British front states that this squadron has been performing six times the amount of work of any other similar squadron which is not supplied with oxygen.

The above are examples of what has already been accomplished towards reducing this "90 per cent;" many other methods are now being developed. Within the past few months has been perfected an apparatus whereby cadets may acquire flying experience and training without leaving the ground.* This machine is a modification of the old-fashioned universal joint, composed of three concentric rings so pivoted together as to permit the fuselage, which is pivoted within the innermost ring, to be put through every possible evolution to be experienced in actual flying. This apparatus is practically an airplane in every respect. The cadet sits in the fuselage and by means of the joystick and rudder puts himself through practically all the evolutions which he is later to experience in the air. An analysis of the "crash reports" has shown that a remarkably large number are solely due to a failure to come out of the spinning nose dive or tight spiral. The only reason that the cadet has failed to come out of these maneuvers is that he had not yet become accustomed to these unusual movements. These evolutions stimulate the internal ears which send nerve-impulses to the brain. The individual has no control over these impulses; the only thing he can do is to learn the significance of these impulses by experience. The problem is extremely simple. All that is needed is that every cadet shall "fly" the apparatus day after day until he is entirely familiar with these new sensations. Any mistake that he makes causes him no harm, because he never leaves the ground. He is then prepared to

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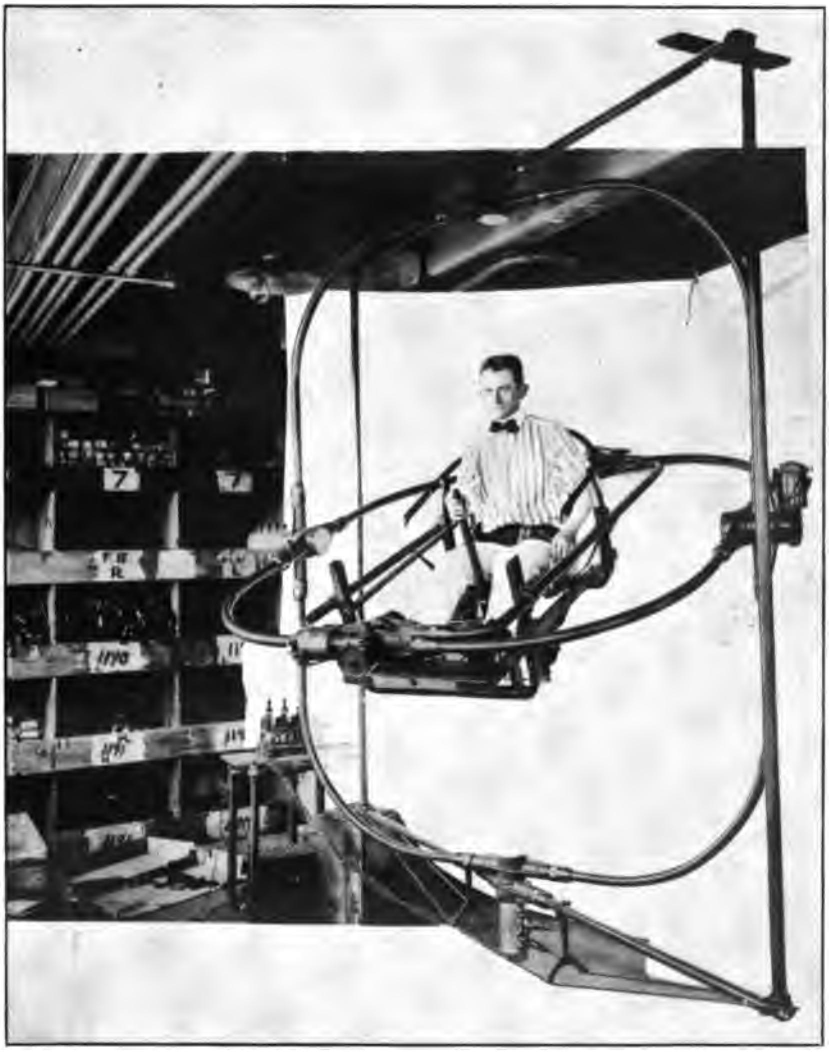
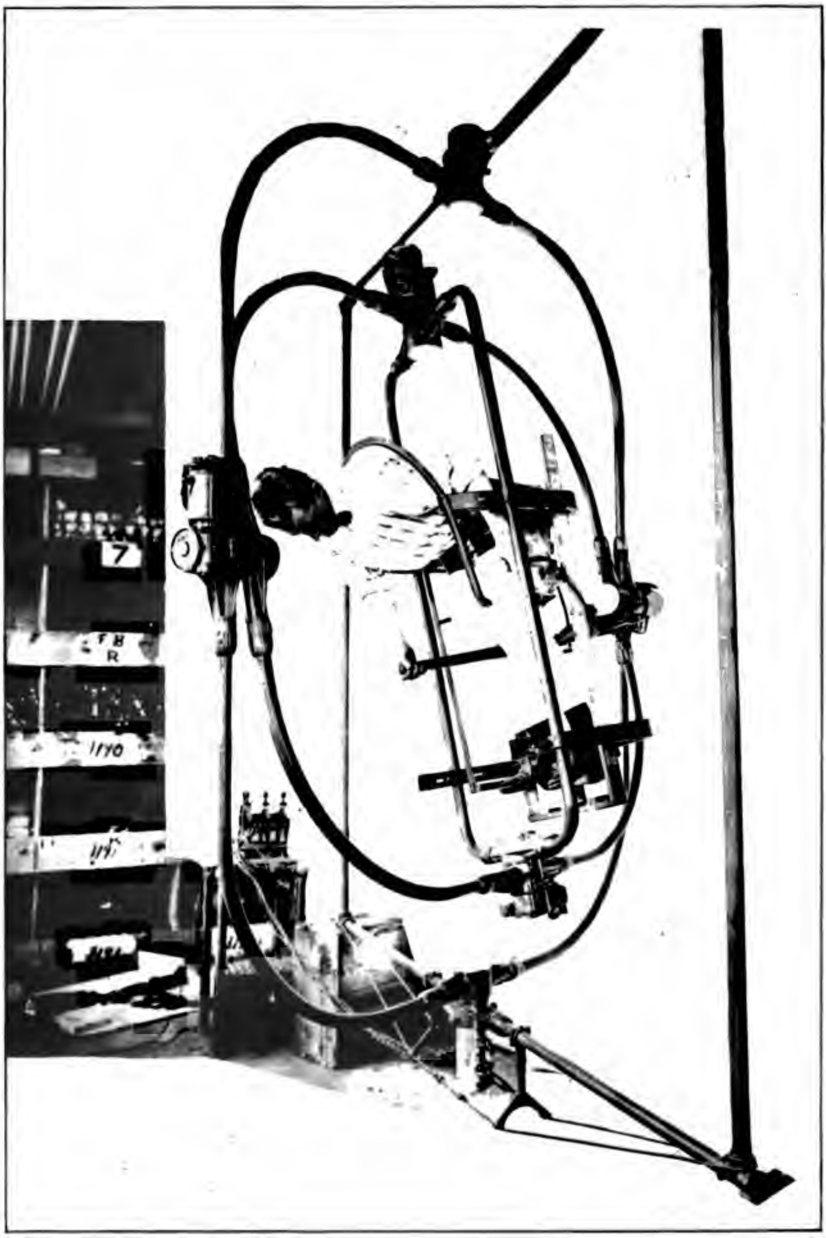
*The Ruggles Orientator.



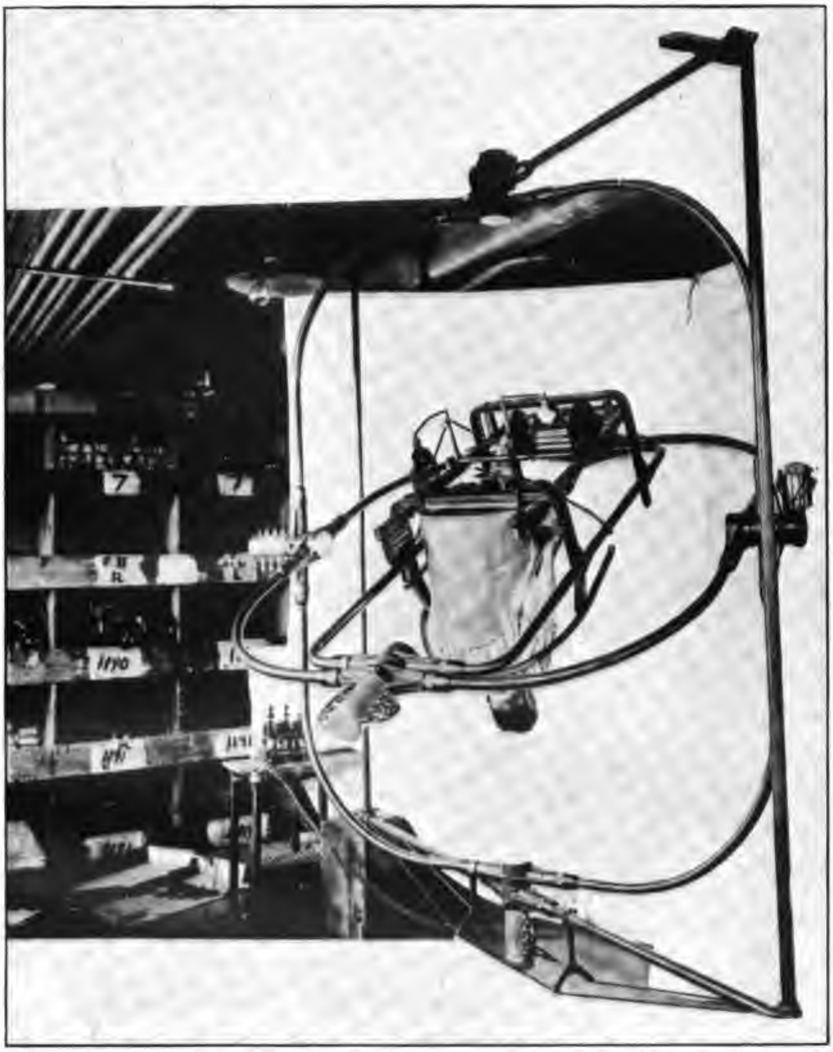
" RUGGLES ORIENTATOR."

(Supplied through the courtesy of the Naval Consulting Board.)



"RUGGLES ORIENTATOR."

(Supplied through the courtesy of the Naval Consulting Board.)



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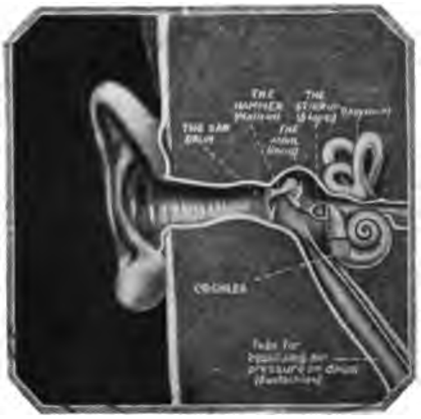
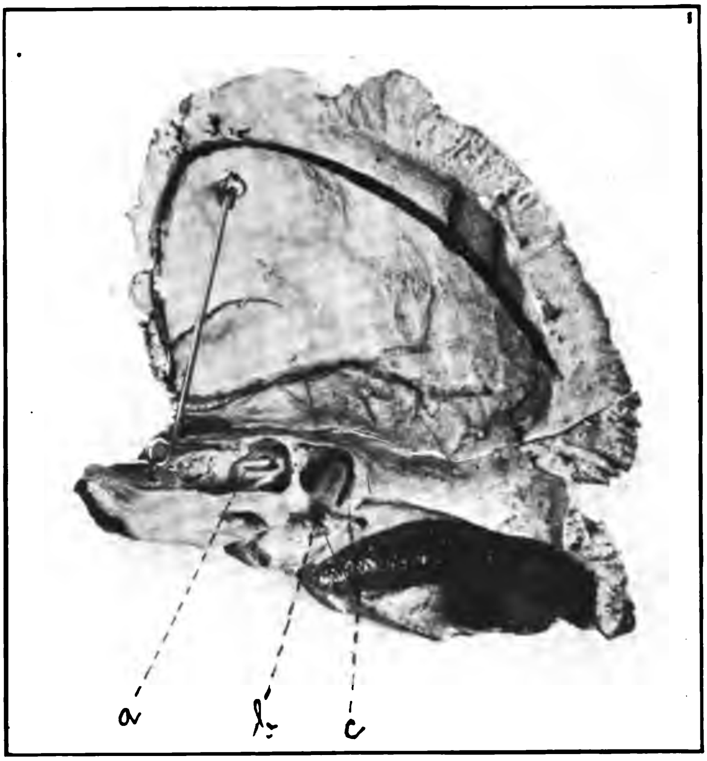


(Diagrammatic.)

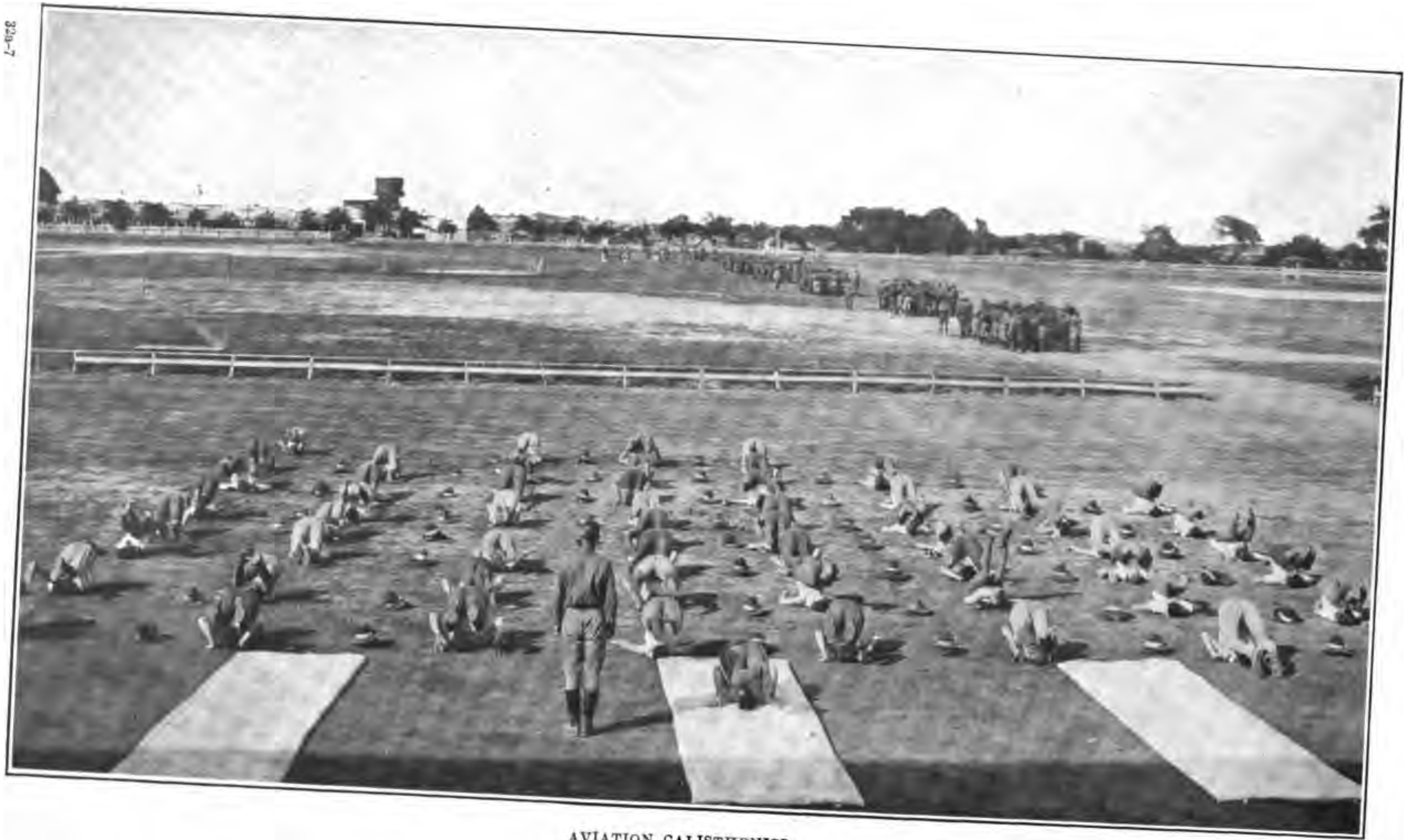
THE SIXTH SENSE. THE THREE SEMICIRCULAR TUBES CONSTITUTE THE "MOTION-SENSING" ORGAN.

The internal ear or labyrinth consists of a bony and a membraneous part, the latter contained in the former. The bony labyrinth is composed of the vestibule, the semicircular canals, and the cochlea. These three canals constitute what is known as the static labyrinth. The bony canals contain the membranous canal, and the membranous canal, in turn, contains the endolymph, which is a fluid that fills the membraneous canal. This posterior part of the internal ear is constructed solely for the detection of movement, and constitutes the special sense organ of "motion-sensing". Man is acquainted with movement through this organ by the flowing of the endolymph within the canals.



HUMAN TEMPORAL BONE, NATURAL SIZE, INTERNAL OR BRAIN SURFACE; SHOWING INTERNAL EAR CONSISTING OF COCHLEA (a), THE SUPERIOR AND POSTERIOR SEMICIRCULAR CANALS (b and c) WHICH HAVE BEEN EXPOSED BY REMOVING PORTION OF THE BONE.

(Actual photograph.)



AVIATION CALISTHENICS.

undertake "stunting" in the air. Flying training by this "ground training flying apparatus" should be under the combined supervision of the officer in charge of flying and the flight surgeon.

Another method of educating the cadet is by means of flying calisthenics. By daily turning and tumbling exercises the cadet, who at first is awkward and bewildered, soon becomes accustomed to positions and movements to which he had previously been unaccustomed.

When we remember that each aviator overseas means an expenditure of upwards of $40,000—as represented by his training in the ground school and in the flying school, by the employment of airplanes and the necessary mechanicians for their upkeep, as well as his personal expense to the Government for pay and transportation—we realize that, apart from the humanitarian standpoint, there is a purely military aspect which demands proper care of this tremendous financial investment. This saving of invaluable human material and money can be accomplished only by providing a specially trained medical officer who, as medical advisor to the Commanding Officer, is charged with the duty of maintaining the mental and physical fitness of the individual fliers of the command. This officer is the Flight Surgeon.

To meet this problem, the general staff authorized this new grade in the tables of organization, the "Flight Surgeon." Authorization was also made for the grade of "Physical Director." The original authorization provided for 50 flight surgeons and 50 physical directors; one flight surgeon, with a physical director as his assistant, was to be provided for each flying school in the United States, and the others for overseas service as needed.

Specifically, "the duty of the Flight Surgeon is to act as advisor to the Commanding Officer of flying schools and squadron groups. Although under the Post Surgeon, he has freedom of independent initiative in all questions of flying fitness of aviators or cadets. Subject to the approval of the Commanding Officer, he is expected to institute such measures as periods of rest, recreation, and temporary excuse from duty, as may seem to him advisable. He takes sick call for aviators and cadets and recommends the disposition of cases excused from duty. He will visit such cases as may be in the hospital at the post and consult with the attending surgeon or physician regarding them. From time to time he will make routine reexaminations of aviators and cadets; also such special examinations as he may deem advisable, being assisted therein by data furnished by the Branch Medical Research Laboratory. He will live in as close touch with the fliers and cadets at his station as is consistent with the conditions."

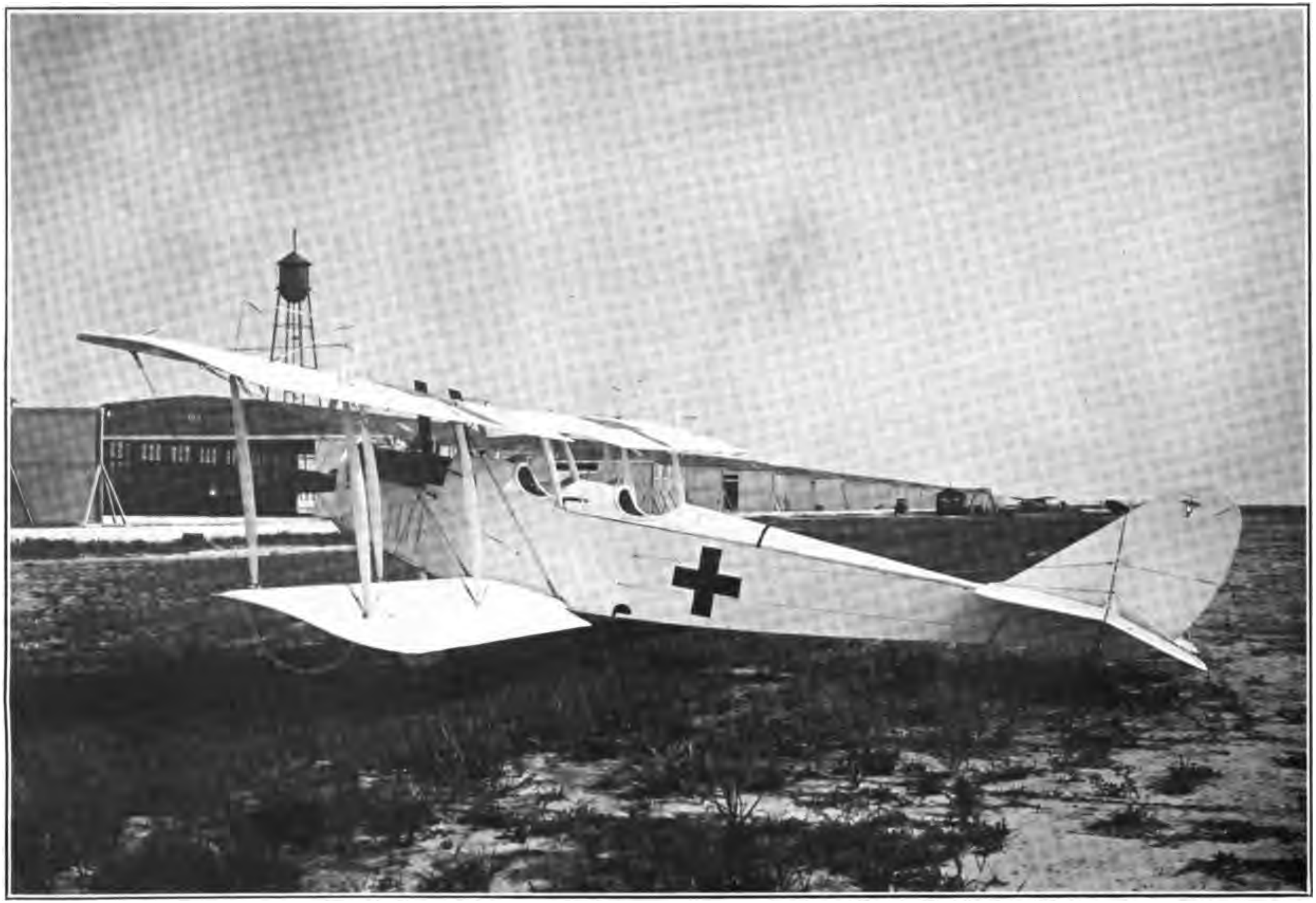
"Each Flight Surgeon will have as an assistant a Physical Director, whose duty is to supervise such recreation and physical training of aviators and cadets as is considered necessary. He will live and mess with the cadets, keep as closely in touch with them as possible, study their habits, temperaments, and physical fitness, and advise the Flight Surgeon in all matters regarding these points."

So much for the official routine; it needs but a glance at the many activities suggested to realize that back of this order was a great need—the daily care and watchfulness over the aviator.

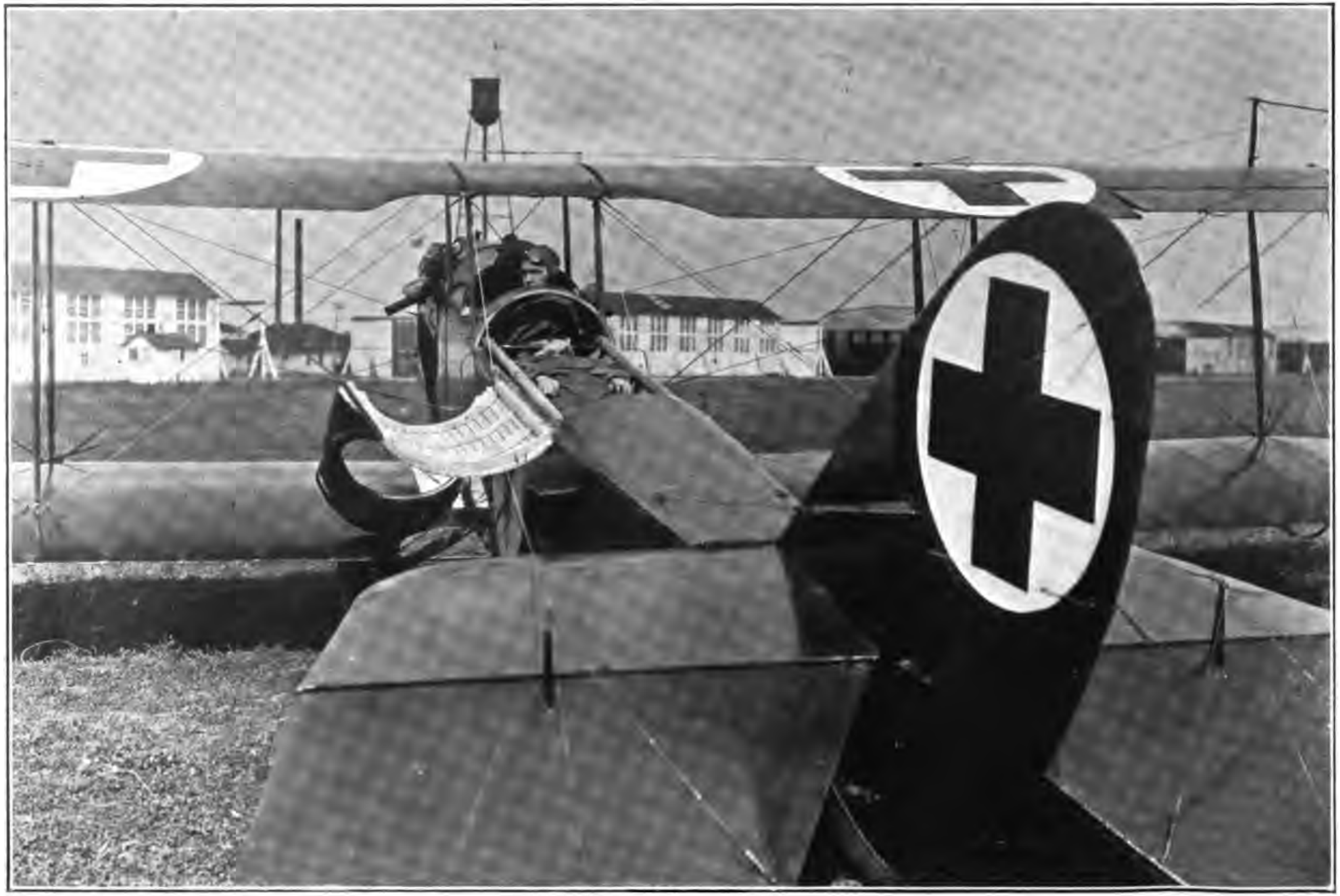
The medical study of aviation is so new that unless a medical officer has been specially trained for the aviation service he can have no idea whatever of the methods of making diagnosis of the ills peculiar to flying. For this highly specialized phase of medical work the Flight Surgeon must have certain special qualifications. For this reason the greatest care has been exercised in the selection of each Flight Surgeon, as it was recognized that the entire success of the work depended upon the personality, experience, and diagnostic skill of the medical officers selected for this special duty.

Ideal material for Flight Surgeons became available when a large number of Physical Examining Units completed their work. Those medical officers were chosen who had had large experience in examining hundreds or thousands of applicants for the service. From this group were selected those whose personality was such that they could not only command the respect but the confidence of the individual aviator. This is essential. The efficient Flight Surgeon is one whose personality is such that the cadet, flying officer, or aviator at the front, feels that he has, in his Flight Surgeon, one to whom he can go without restriction—in the same spirit with which, in civilian life, he was accustomed to consult his family physician. When a prospective Flight Surgeon had been selected for his exceptional ability and knowledge of the special diagnostic tests, and for his personality, he was then sent to the Medical Research Laboratory at Mineola, Long Island, where he received intensive training in those special tests with which he had not yet become familiar in his original examining work.

The Flight Surgeon was also given adequate opportunity to acquire actual flying experience both at Mineola and at the flying fields. This enabled him to supplement his other special preparations for his own peculiar work with the much needed first-hand "knowledge of the air." Permission has been granted by the Director of Military Aeronautics for these officers, among others, to take regular ground and air courses of instruction in flying, and many of the Flight Surgeons have already qualified for R. M. A. Actual flying is of great value as an additional aid in rendering the Flight Surgeon better able



HOSPITAL SHIP.



AMBULANCE SHIP.

This ship is painted red with white circles in which is a red cross, thus easily seen in the air, all other ships giving it right of way. Enables patient to be taken to hospital quickly and with no jarring.

BOXING.

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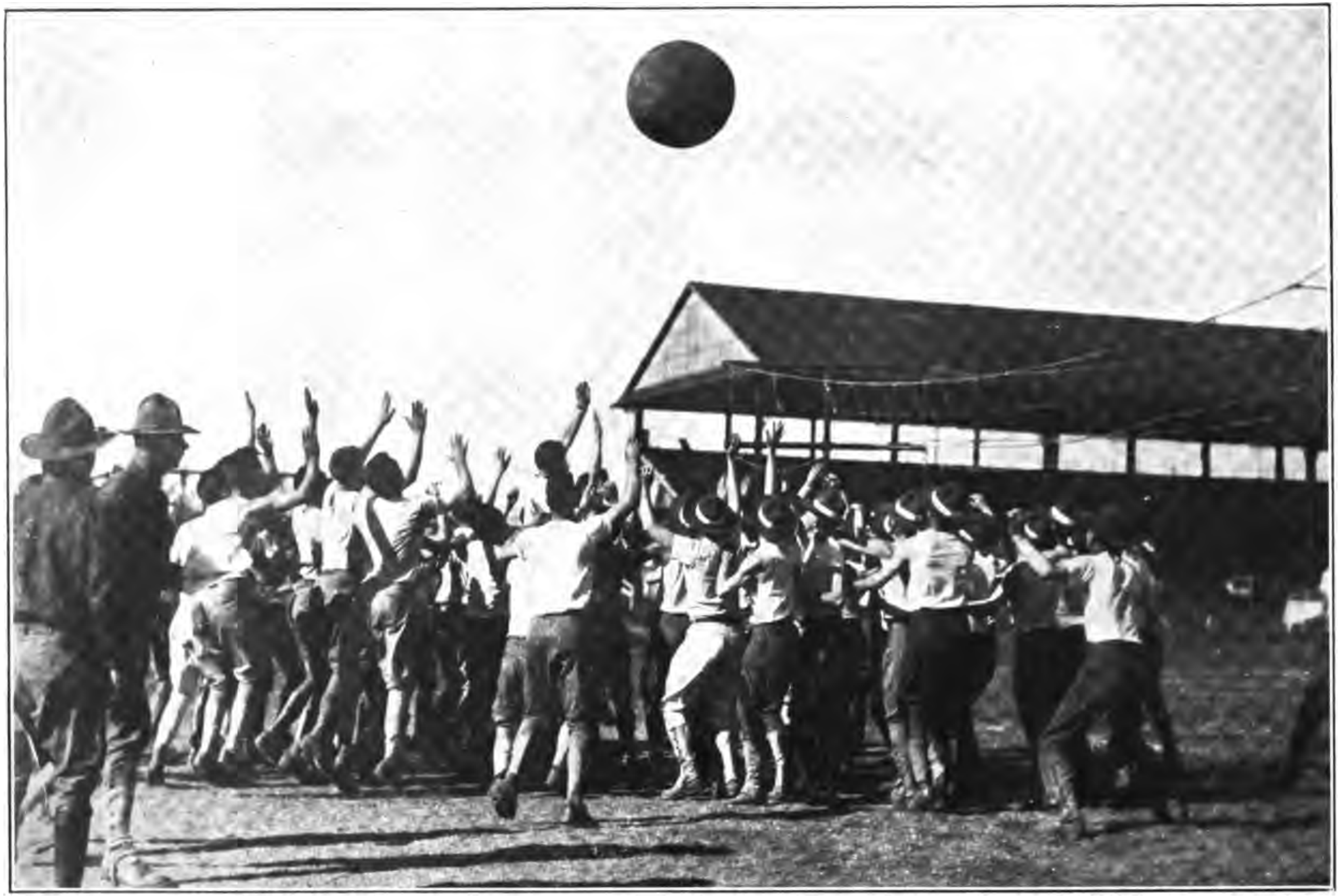
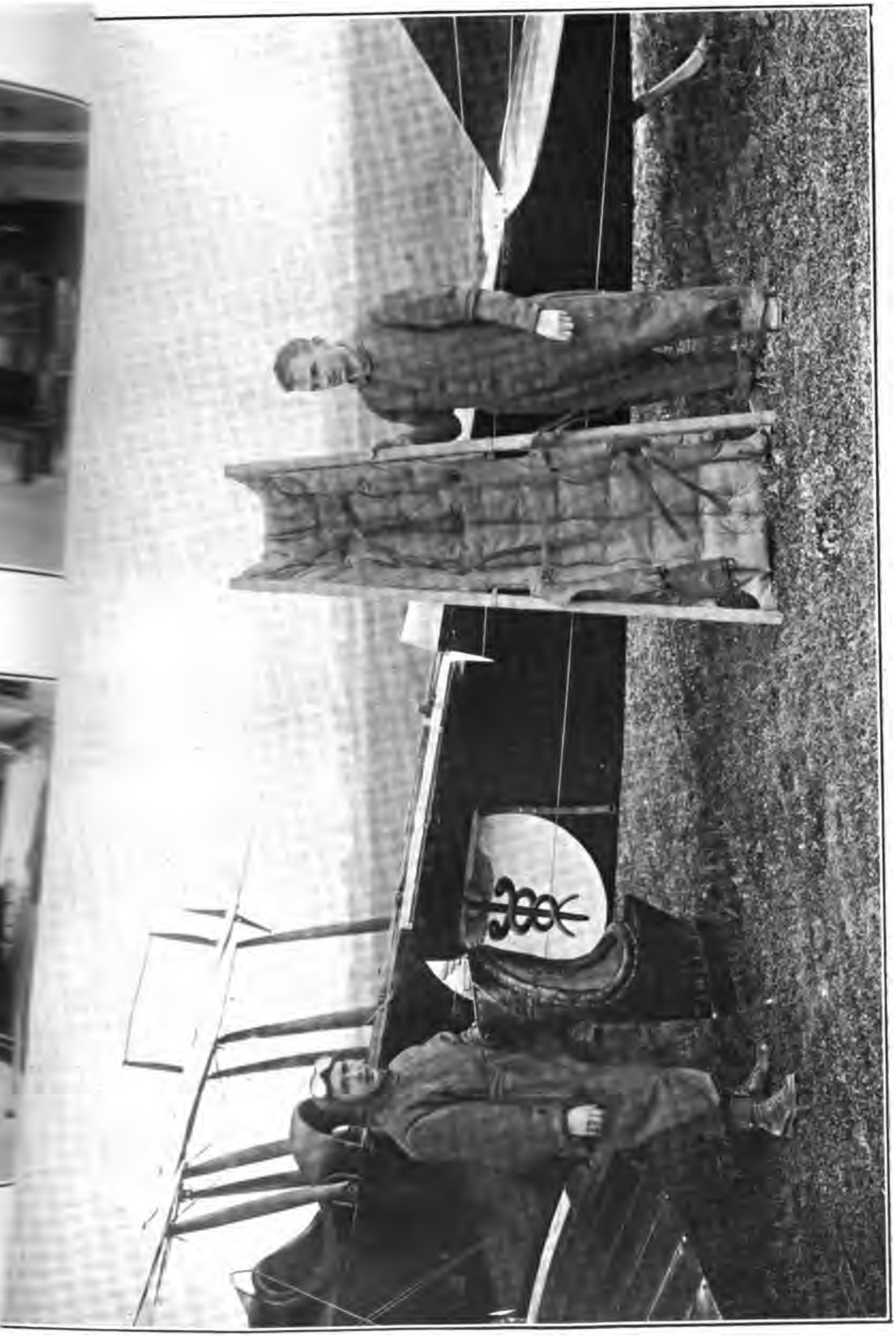
TUG OF WAR.



NET BALL.

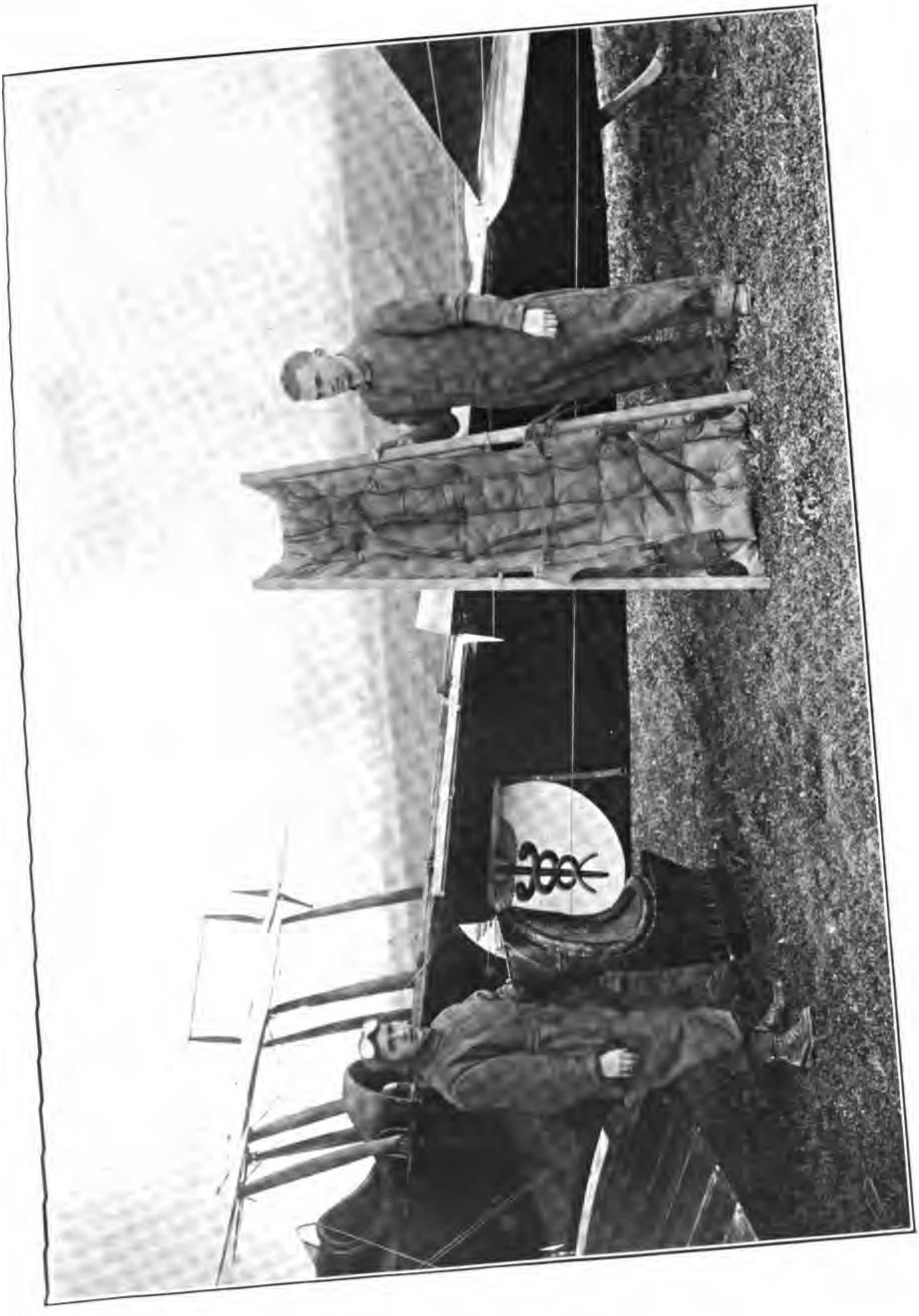
POOL

BOWLING



POOL.

BOWLING.



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MAJ. WM. R. REAM, THE FIRST FLIGHT SURGEON TO BE PUT ON FLYING STATUS.

MAJ. REAM IN HIS PLANE.

to realize and cope with the peculiar conditions and ills incidental to aviation.

At the Medical Research Laboratory he was enabled to secure all the up-to-the-minute information regarding the eye, ear, nose and throat, cardio-vascular, physiologic, psychiatric, and psychologic work. Of the new problems taken up at the Medical Research Laboratory, studies in psychiatry were of peculiar importance. No Flight Surgeon can adequately diagnose an aviator's condition who has not the ability to determine the mental condition of the individual. If an aviator is having sleepless nights, worrying over financial problems, anxieties regarding the wife at home who is about to become a mother, or other anxieties of everyday occurrence in human life, it is not surprising if we find that he is not in fit condition to fly. It has been repeatedly proven that if the aviator who has been flying badly under such a mental handicap, tells his troubles to an intelligent and sympathetic listener, he is almost invariably able to " get hold of himself," after which he goes out again and flies well. The Medical Research Laboratory provides instruction in all these essential branches; after a course of four or five weeks of such intensive instructions the Flight Surgeon is then sent to work among the aviators, under actual service conditions.

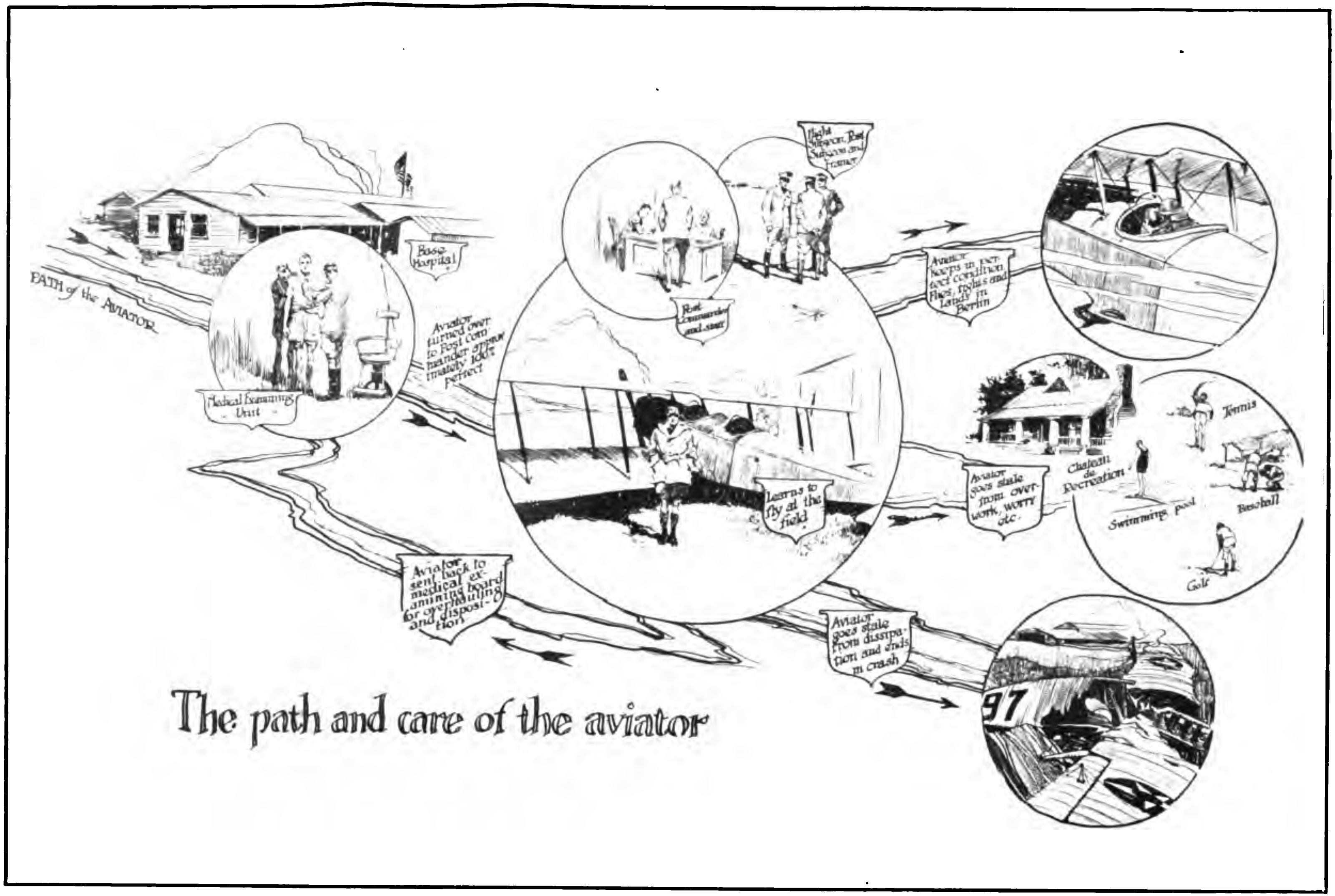
It has become evident during the past nine months through activities of nutritional survey parties of the Food Division, Surgeon General's Office, that there is great need in each aviation camp for a Nutrition Officer. Stated in the briefest terms the needs for his services are these:

The strain on the flier—especially the mental strain—is great. He is very susceptible while on flying duty to influences that would ordinarily not affect him at all. To reach and maintain his maximum efficiency requires his being in the best physical and mental condition. In peace times, under conditions where neither life and death nor great ideals are at stake, a " training table " is maintained for club or college athletes. This is done because it is recognized that improper feeding may reduce a man's efficiency, or even put him " out of the running " in a contest in which his best is required to win. In the case of the flier we are concerned, when he goes up, not only with questions of life and death and ideals, but with the fact that he, more than the average athlete, depends for success upon clearness of mind, quickness of thought, keenness of judgment. All these are mental faculties, not muscular. The nervous system is more highly differentiated than the muscular system, and by reason of that fact more easily upset by improper food.

For the highest efficiency of the flier there is required some form of training table. At times when he is slightly unfit, with headache, constipation, etc., this is doubly needed. A Nutrition Officer with special training in knowledge of food values should supervise the messes of all students and officer fliers in order to keep up the efficiency of the fliers and prevent as far as possible the development of digestive ailments of even minor character. But in addition to this, every flier who develops a digestive disorder should constitute a special problem for the Nutrition Officer so that he may become "fit" again at the earliest possible moment. With such food supervision the general efficiency of the fliers can be raised definitely, the number of hours per month that these men are fit for flying duty increased, and finally the danger to both life and equipment of the flier greatly reduced.

With expert supervision of the flier's nutrition and exercise, supplementing his own professional knowledge concerning flying and the aviator, the Flight Surgeon neglects nothing of a practical value which can be used in maintaining in the highest degree the physical efficiency of the Air Fighting Force.

Without exception the Commanding Officers of the aviation fields have welcomed the advent of the Flight Surgeon. They realize the tremendous responsibility of sending a man into the air who may, at the time, be mentally or physically unfit for flying. No Commanding Officer has, for the sake of a large record, ever shown a tendency to force his men into the air. From a military standpoint they realize that an attempt to escape duty on the part of an aviator is an altogether different matter from such an attempt of men enlisted in other branches of the service. The Commanding Officer, or officers in charge of flying, who are constantly observing their men in flight, sense certain transitory changes in a man's condition which impair his air efficiency. They are often called upon to ground such a man or relieve him from duty. It is not to be wondered at, therefore, that they welcome the support of the Flight Surgeon who adds a medical knowledge to their own, which after all is based upon experience alone. The Flight Surgeon, in addition to maintaining at the highest point the physical efficiency of the flying force of a command, is prepared at any time to furnish to the Commanding Officer a reliable expert opinion as to each individual's mental and physical fitness for flying duty.


PATH of the AVIATOR
Base Hospital
Medical Examining Unit
Aviator turned over to Post Commander approximately 100% perfect
Post Commander and staff
Flight Surgeon, Post Surgeon and Trainer
Learns to fly at the field
Aviator keeps in perfect condition, flies, fights and lands in Berlin
Aviator goes stale from overwork, worry, etc.
Chateau de Recreation
Tennis
Swimming pool
Baseball
Golf
Aviator goes stale from dissipation and ends in crash
97
Aviator sent back to medical examining board for overhauling and disposition

The path and care of the aviator

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